FINAL TRAFFIC CONTROL PLAN
FOR
CONSTRUCTION TASKS
GM-38 AREA GROUNDWATER REMEDIATION
AT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

Issued:

May 8, 2006

Prepared for:

Engineering Field Activity, Northeast
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Remedial Action Contract No. N62472-99-D-0032
Contract Task Order No. 96

Prepared by:

Tetra Tech EC, Inc.
Bucks Town Corporate Campus
820 Town Center Drive, Suite 100
Langhorne, PA 19047-1748

Revision	Date	Prepared By	Approved By	Pages Affected
0	5/8/06	Joseph Gray	Stavros Patselas	All

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CTO	Contract Task Order
GOCO	Government Owned Contractor-Operated
mph	miles per hour
NGC	Northrop Grumman Corporation
NWIRP	Naval Weapons Industrial Reserve Plant
NYSDOT	New York State Department of Transportation
NYSMUTCD	New York State Manual of Uniform Traffic Control Devices
RAC	Remedial Action Contract
TtEC	Tetra Tech EC, Inc.
µg/L	micrograms per liter
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has prepared this Traffic Control Plan in accordance with the Remedial Action Contract (RAC) Number N62472-99-D-0032, Contract Task Order (CTO) Number 0096.

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this plan refers to the Navy's representative or agent, TtEC. All subcontractors and vendors contracted by TtEC will be required to comply with this Traffic Control Plan.

This document presents the Traffic Control Plan for the GM-38 Area Groundwater Remediation project at the Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, NY. This Traffic Control Plan will be considered one of the contract documents for this project. This Traffic Control Plan covers the control and orderly movement of vehicles and equipment at the NWIRP Bethpage, NY during construction activities.

1.1 Basic Maintenance and Protection of Traffic

Traffic will be maintained over a reasonably smooth traveled way which will be so marked by signs, delineators, guiding devices and other methods that a person who has no knowledge of conditions may safely and with minimum of discomfort and inconvenience ride, drive or walk, day or night, over all or any portion of the highway and/or structure under construction where traffic is to be maintained. All work will conform to the requirements of the New York State Manual of Uniform Traffic Control Devices (NYSMUTCD).

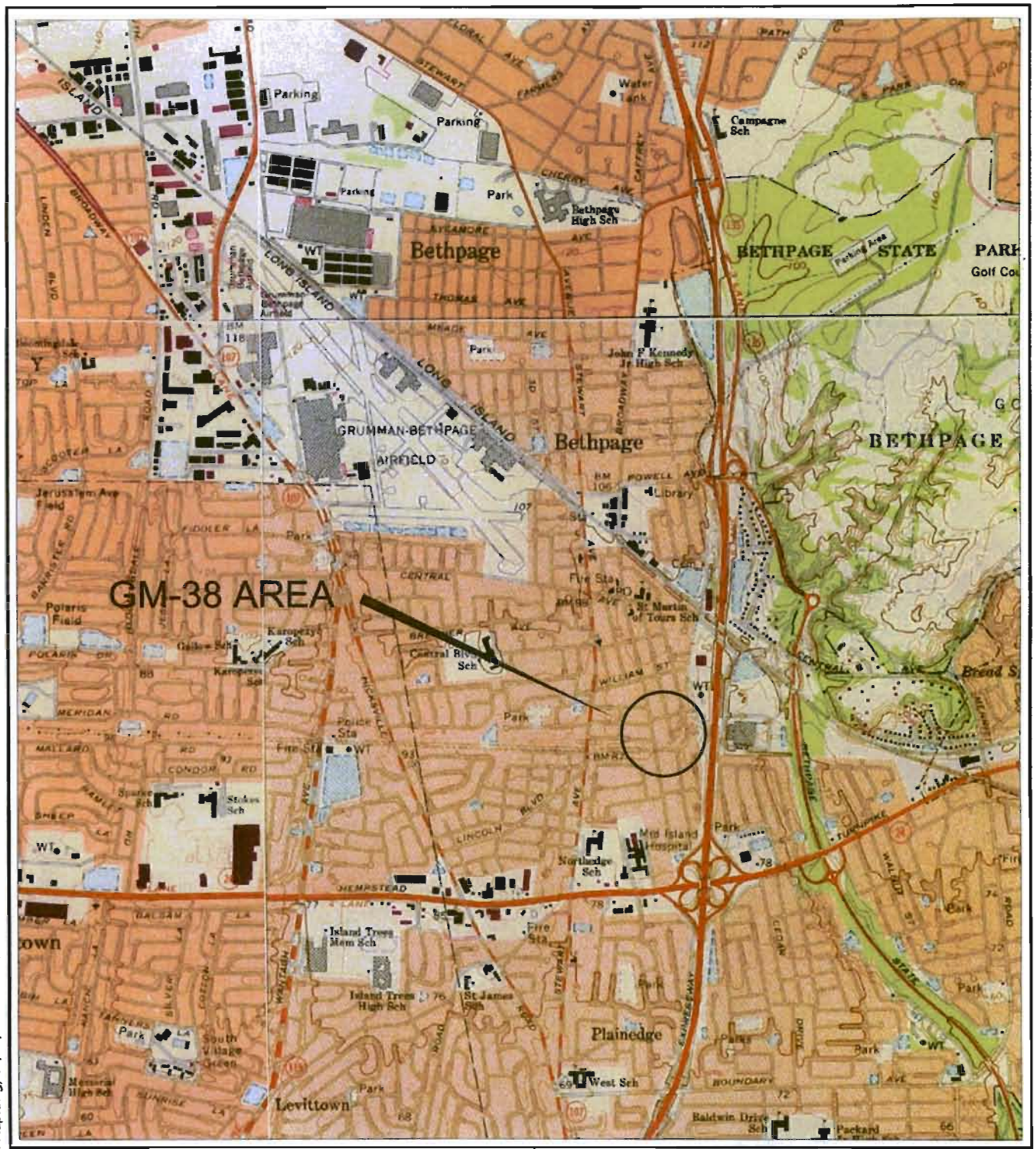
2.0 BACKGROUND

NWIRP Bethpage is located in east central Nassau County, Long Island, New York, approximately 30 miles east of New York City (Figure 1 Site Location Map). The Navy's property totaled approximately 109.5 acres and was formerly a Government Owned Contractor-Operated (GOCO) facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. NWIRP Bethpage is bordered on the north, west, and south by property owned, or formerly owned, by NGC that covered approximately 605 acres, and, on the east, by a residential neighborhood.

The GM-38 Area is approximately 8,500 feet south-southeast and hydraulically down gradient of NWIRP Bethpage. Specifically, the center of the project area is a utility easement that is located east of Broadway Avenue, west of the Seaford – Oyster Bay Expressway, and between the north and south dead ends of Windhorst and Herman Streets.

The GM-38 Area refers to a cluster of monitoring wells that were installed in the 1990s by NGC and that first identified an isolated groundwater contaminant plume in this area. Chlorinated volatile organic compounds (VOCs) were identified in moderately deep groundwater (220 to 470 feet below ground surface (bgs) at concentrations greater than 500 micrograms per liter (µg/L). The contaminated groundwater in the area represents a relatively large mass of chlorinated VOCs that would remain for extended periods and could adversely affect public water supplies in the area, as well as other down gradient water supplies. Two public water supply systems are present in the general area and extract groundwater at depths ranging from 540 to 740 feet bgs.

The Navy's selected remedy in the vicinity of the GM-38 Area is construction of a groundwater extraction and treatment system near the GM-38 monitoring well cluster to facilitate the removal of contaminants in the groundwater.



Source: U.S.G.S. Topographic Maps (7.5 Minute)
Amityville, Freeport, Hicksville, Huntington, NY Quadrangles

U.S. Navy RAC
Engineering Field Activity, Northeast
GM-38 Area (Offsite)
NWIRP Bethpage
Bethpage, NY

Figure 1
Site Location Map

TETRA TECH EC, INC.

P:\Bethpage\CAD - GIS\Site Location Map.dwg, 04/28/2004 03:22:20 PM

3.0 CONSTRUCTION ACTIVITIES

3.1 Location

The area of construction will be in the GM-38 Area as described in Section 2.0. The majority of construction activities will be located within the utility easement in the GM-38 Area and will not impact any public right-of-way.

Access to the GM-38 Area will be required to allow for deliveries of construction equipment and materials. Access will be through an entrance/exit located on the east side of Broadway Avenue approximately 100 feet south of the intersection of Broadway Avenue and Arthur Avenue. A temporary curb cut will be completed to establish the construction entrance/exit on Broadway Avenue. The curb will be restored to original conditions upon completion of the project.

Vehicles traveling to and from the site will be restricted to either a primary or a secondary route when traveling in the local vicinity of the GM-38 Area (Figure 2 Traffic Control Routes). All vehicles except tractor-trailers will follow the primary route listed below. Tractor-trailers may have difficulty negotiating the turn from Arthur Avenue to Broadway Avenue and are directed to use the secondary route.

- Primary Route (for all vehicles except tractor trailer units): Approach the site from Stewart Avenue. At the intersection of Stewart Avenue and Arthur Avenue turn east onto Arthur Avenue. At the end of Arthur Avenue make a right turn onto Broadway Avenue. Travel south on Broadway Avenue for approximately 100 feet and make a left turn into the construction entrance for the site.

- Secondary Route (tractor trailers only): Approach the site from Central Avenue. At the intersection of Central Avenue and Broadway Avenue turn south onto Broadway Avenue. Follow Broadway Avenue south and make a left turn into the construction entrance for the site.

3.2 Schedule and Hours of Operation

The project schedule is provided in Appendix A and outlines the anticipated timeline associated with construction activities. It is estimated that the total duration of the project will be approximately 12 months. Construction activities will be conducted between the hours of 0700 and 1700 hours 5 days/week, Monday through Friday.

3.3 Permits

TtEC will obtain the necessary permits as required from the local authorities having jurisdiction. Additionally TtEC will notify New York City and Long Island One-Call to obtain mark-outs of existing underground utilities. Having received confirmation of the underground utility mark-out and 5 days prior to construction activities, TtEC will notify the local Police and Fire Departments and other Municipal offices as may be required.

NOTES:

1. SANITARY SEWER MANHOLE LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED. ALL SEWER PIPE INVERTS (WHERE SHOWN) ARE AS PER NASSAU COUNTY SANITARY SEWER RECORD PLANS.
2. THE LOCATION OF OVERHEAD AND UNDERGROUND ELECTRIC LINES SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY LIPA UNLESS OTHERWISE NOTED.
3. THE LOCATION OF GAS MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY KEYSPAN.
4. THE LOCATION OF WATER MAINS SHOWN ON THIS MAP ARE AS PER UTILITY MAPS PROVIDED BY THE BETHPAGE WATER DISTRICT.
5. STORM SEWER DRAINAGE MANHOLE LOCATIONS, CATCH BASIN LOCATIONS AND RIM ELEVATIONS ARE AS PER L.K. McLEAN ASSOCIATES FIELD DATA EXCEPT WHERE OTHERWISE NOTED.
6. THE LOCATION OF THE DRAINAGE (STORM SEWER) PIPES ON SOPHIA STREET HAVE NOT BEEN ESTABLISHED. THERE IS NO DATA ON RECORD AT THE TOWN OF OYSTER BAY DEPARTMENT OF PUBLIC WORKS.
7. MEASUREMENTS ARE IN ACCORDANCE WITH U.S. STANDARDS.
8. COORDINATES AND BEARINGS SHOWN ARE IN LONG ISLAND ZONE OF THE NEW YORK STATE PLANE COORDINATE SYSTEM NAD 1983. ELEVATIONS REFER TO NAVD 1929.
9. UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF NEW YORK STATE EDUCATION LAW.
10. ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S "EMBOSSED" SEAL OR "INKED" SEAL SHALL BE CONSIDERED TO BE VALID TRUE COPIES.
11. CERTIFICATIONS INDICATED HEREON SIGNIFY THAT THIS SURVEY WAS PREPARED IN ACCORDANCE WITH THE EXISTING CODE OF PRACTICE FOR LAND SURVEYORS ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS. SAID CERTIFICATIONS SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED, AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.
12. RIGHTS-OF-WAY NOT SHOWN ARE NOT CERTIFIED.
13. FOUR INJECTION WELLS POSITIONED 80 FEET APART ARE EACH PREDICTED TO HANDLE SUSTAINABLE INJECTION FLOW RATES OF 275 GALLONS PER MINUTE (GPM) FOR A CUMULATIVE FLOW OF 1,100 GPM. NUMBER OF INJECTION WELLS AND SPACING IS BASED UPON REGIONAL GROUNDWATER MODEL RESULTS PRESENTED BY TETRA TECH NUS, INC. IN THE "GROUNDWATER REMEDY ANALYSIS REPORT" DATED FEBRUARY 2003.
14. LINES IDENTIFIED ON THIS DRAWING AS PART OF GWTP PROJECT ILLUSTRATE APPROXIMATE AND DO NOT REPRESENT ACTUAL PIPE/WIRE SIZES OR TRENCH WIDTHS.
15. TEMPORARY ACCESS ROAD ENTRANCE FROM BROADWAY AVE. SHALL INCLUDE 20 FT. CURB CUT FOR INSTALLATION OF CONCRETE DRIVEWAY APRON.
16. SANITARY LINE SHALL MAINTAIN 1-2% SLOPE FROM BUILDING TO THE DESIGNATED MANHOLE. CONNECTION INTO MANHOLE SHALL BE A MINIMUM OF 48" BELOW MANHOLE RIM ELEVATION. SEWER CONNECTION PERMIT SHALL BE OBTAINED FROM THE COUNTY OF NASSAU, DEPT. OF PUBLIC WORKS PRIOR TO WORK INITIATION.
17. ELECTRICAL AND TELEPHONE TIE-IN CONNECTIONS ARE AT POLE L.I.L. #18.
18. POTABLE WATER LINE TIE-IN LOCATION SHALL BE ON THE EASTERN SIDE OF THE FUTURE PERMANENT ACCESS ROAD TO THE TREATMENT BUILDING. WATER METER PIT SHALL BE LOCATED ADJACENT TO THE ACCESS ROAD ENTRANCE AT SOPHIA STREET. A REDUCED PRESSURE ZONE DEVICE SHALL BE LOCATED DOWNSTREAM OF METER PIT IN AN ABOVEGRADE VAULT. PLANS AND APPLICATIONS MUST BE APPROVED BY THE BETHPAGE WATER DISTRICT AND NASSAU COUNTY DEPT. OF HEALTH PRIOR TO INSTALL.
19. THE RW-2 EFFLUENT PIPING TRENCH SHALL ALSO CONTAIN 12 IN X 8 IN. HDPE PIPE FOR POTENTIAL FUTURE WELL CONNECTION AND A 12 IN. HDPE PIPE FOR POTENTIAL FUTURE ALTERNATE DISCHARGE POINT. BOTH PIPES FOR POTENTIAL FUTURE USE SHALL BE BLIND FLANGED AND INSIDE A TERMINATION VAULT

REFERENCE:

L. K. McLEAN ASSOCIATES, P.C.
437 SO. COUNTRY ROAD, BROOKHAVEN, NY
TOPOGRAPHIC SURVEY, NAVAL WEAPONS INDUSTRIAL RESERVE PLANT,
GM-38 AREA, FILE # 04033.000
AUGUST 2, 2004

LEGEND:

- = TAX LOT LINE
- = OVERHEAD ELECTRIC WIRES
- = UNDERGROUND ELECTRIC WIRES
- — NE — = NEW UNDERGROUND ELECTRIC WIRES
- — NW — = NEW WATER LINE
- = WATER MAIN
- = GAS MAIN
- = DRAINAGE LINES (STORM SEWER)
- = SANITARY SEWER MAIN
- — NS — = NEW SANITARY SEWER MAIN
- = HDPE PIPE AND ELECTRICAL CONDUIT
- = TAX LOT NUMBER
- = WATER VALVE
- = GAS VALVE
- = LOT NUMBER
- = INJECTION WELL
- = MONITORING WELL
- = RECOVERY WELL
- PB = PULL BOX
- = PRIMARY ROUTE
- = SECONDARY ROUTE

GRAPHIC SCALE

SCALE: 1 INCH = 80 FEET

THIS DRAWING PRODUCED ON AUTOCAD DO NOT REVISE MANUALLY

"THIS DOCUMENT IS THE PROPERTY OF NAVAL FACILITIES ENGINEERING COMMAND, PREPARED BY TETRA TECH EC, INC., AND IS PROVIDED UPON THE CONDITION THAT IT WILL NOT BE REPRODUCED, COPIED, OR ISSUED TO A THIRD PARTY, AND WILL BE USED SOLELY FOR THE ORIGINAL INTENDED PURPOSE AND SOLELY FOR THE EXECUTION OR REVIEW OF THE ENGINEERING CONSTRUCTION OF THE PROJECT"

IT IS A VIOLATION OF THE NEW YORK STATE EDUCATION LAW, ARTICLE 145, FOR ANY PERSON, UNLESS UNDER THE DIRECTION OF A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER, TO ALTER AN ITEM ON THIS DOCUMENT IN ANY WAY

REV	DESCRIPTION	PREP BY	DATE	APPRVD

TETRA TECH EC, INC.

DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

ENGINEERING FIELD ACTIVITY - NORTHEAST

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT — BETHPAGE, NEW YORK

GM-38 AREA
GROUNDWATER TREATMENT PLANT
TRAFFIC CONTROL ROUTES

SEAL AREA

CODE I.D. NO. 80091
SCALE: AS SHOWN
CONSTR. CONTR. NO. N62472-99-D-0032
SIZE: D
Fig. 2

3

4.0 CONSTRUCTION IMPACTS

4.1 Pedestrian Safety

There are no designated pedestrian crossways, sidewalks, bicycle routes or lanes in the area where the temporary construction entrance will be constructed on Broadway Avenue.

4.2 Traffic Control and Signal Devices

There are no traffic controller assemblies, signal heads, detectors or signal devices in the vicinity of the proposed temporary construction entrance on Broadway Avenue.

4.3 Traffic Flow Interference

There may be minimal traffic interference that occurs during the construction of the temporary construction entrance or by trucks entering and exiting the GM-38 Area. TtEC will provide proper traffic notification by several methods including flaggers and caution signs to inform the traffic flow of a construction entrance and work ahead. The signs will be New York State Department of Transportation (NYSDOT) approved and placed as per the sign detail locations illustrated on Figure 2 Traffic Control Routes.

All work will be performed in compliance with the applicable articles of Maintenance and Protection of Traffic, (NYSDOT) Standard Specifications Section 619 (Appendix B).

5.0 CONSTRUCTION ENGINEERING CONTROLS

5.1 Speed Limits

Truck traffic will adhere to a speed limit of 25 miles per hour (mph) on the local public roads in the vicinity of the GM-38 Area. Within the GM-38 Area truck traffic will adhere to a speed limit of 10 mph.

5.2 Traffic and Construction Signage

NYSDOT approved signs will be erected near the temporary construction entrance, which is indicated on Figure 2 Traffic Control Routes. The intent of the signs will be to provide sufficient notice of the construction entrance and warn traffic that trucks may be entering the roadway. Signs will also be erected within GM-38 denoting the 10 mph speed limit. Speed limit signs will be placed at the entrance, at the access road mid-point, and approximately 50' feet prior to the treatment plant work area. The speed limit signs will be double sided so that they can be visible when exiting the site.

5.3 Flagger

During installation of the temporary construction entrance the necessary traffic control equipment and flaggers will be provided to maintain adequate traffic control.

5.4 Repairs

Any damage to the existing pavement and curb as a result of the installation of the temporary construction entrance will be repaired to provide a reasonably smooth roadway where vehicle traffic is maintained. Within the GM-38 Area the gravel access road will be repaired and maintained as necessary so that the surface condition is consistent with the posted speed limit.

5.5 Drainage

Any existing drainage facilities near the temporary construction entrance will be maintained to provide adequate drainage of the roadway. The gravel access road will be graded to facilitate adequate drainage and prevent accumulation of standing water.

5.6 Dust Control and Spillage

The gravel access road within the GM-38 Area will be maintained at all times to minimize and control dust. Any material spilled or tracked onto the public roadway will be removed at the end of each work day.

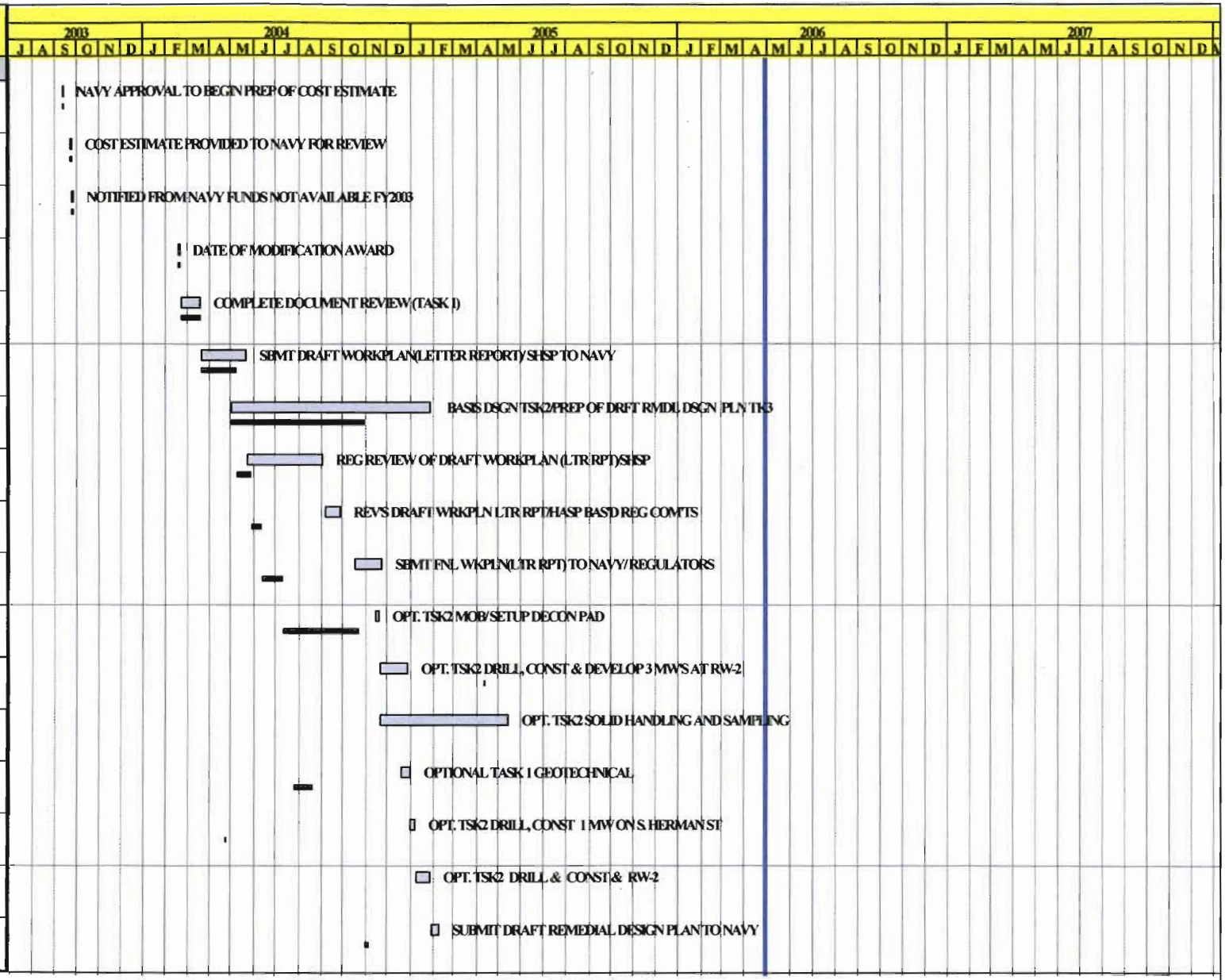
All work areas will be maintained within the limits of work, staging area and along haul routes, in order to prevent dust generation due to this operation that would contribute to air pollution. Dust control will be accomplished by the sprinkling of water or a dilute solution (less then

0.05%) of water plus bio-degradable surfactant. Sprinkling, where used, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times. Dust control will be performed as the work proceeds and whenever a dust nuisance or hazard occurs. Light bituminous treatment of the soil or work area is not an acceptable method of dust control.

Appendix A

Project Schedule

Early Start	Early Finish	% Comp	Activity
Phase 1 Groundwater Remediation			
12SEP03A	12SEP03A	100	NAVY APPROVAL TO BEGIN PREP OF COST ESTIMATE
23SEP03A	23SEP03A	100	COST ESTIMATE PROVIDED TO NAVY FOR REVIEW
25SEP03A	25SEP03A	100	NOTIFIED FROM NAVY FUNDS NOT AVAILABLE FY2003
19FEB04A	19FEB04A	100	DATE OF MODIFICATION AWARD
23FEB04A	19MAR04A	100	COMPLETE DOCUMENT REVIEW (TASK I)
22MAR04A	21MAY04A	100	SBMT DRAFT WORKPLAN(LETTER REPORT)/ SHSP TO NAVY
03MAY04A	28JAN05A	100	BASIS DSGN TSK2/PREP OF DRFT RMDL DSGN PLN TK3
24MAY04A	03SEP04A	100	REG REVIEW OF DRAFT WORKPLAN (LTR RPT)/SHSP
07SEP04A	28SEP04A	100	REVS DRAFT WRKPLN LTR RPT/HASP BASD REG COMTS
18OCT04A	24NOV04A	100	SBMT FNL WKPLN(LTR RPT) TO NAVY/REGULATORS
17NOV04A	19NOV04A	100	OPT. TSK2 MOB/SETUP DECON PAD
22NOV04A	28DEC04A	100	OPT. TSK2 DRILL, CONST & DEVELOP 3 MW'S AT RW-2
22NOV04A	13MAY05A	100	OPT. TSK2 SOLID HANDLING AND SAMPLING
20DEC04A	31DEC04A	100	OPTIONAL TASK 1 GEOTECHNICAL
03JAN05A	07JAN05A	100	OPT. TSK2 DRILL, CONST 1 MW ON S. HERMAN ST
10JAN05A	28JAN05A	100	OPT. TSK2 DRILL & CONST & RW-2
31JAN05A	08FEB05A	100	SUBMIT DRAFT REMEDIAL DESIGN PLAN TO NAVY



Start Date	30SEP03
Finish Date	18JAN08
Data Date	28APR06
Run Date	27APR06 10:53

Early Bar
Target Bar
Progress Bar

C96P Sheet 1 of 4

CONTRACT TASK ORDER NO. 96

BETHPAGE, NEW YORK

GM-38 PUMP AND TREAT SYSTEM

Early Start	Early Finish	% Comp	
07FEB05A	24FEB05A	100	OPT. TSK2 DRILL. & CONST RW-1
08FEB05A	14MAR05A	100	NAVY & 3RD PARTY REVIW OF DRFT RMDL DSGN PLN
24FEB05A	07MAR05A	100	CLEAR GRUB & INSTL ACCESS RD ON NYSDOT ROW (PA)
14MAR05A	11NOV05A	100	REVS DRFT RMDL DSN BASD ON NAVY COMTS & FLD
14MAR05A	08APR05A	100	OPT.TSK2 DRILL.& CONST RW-1 & MW IN NYSDOT
18APR05A	24JUN05A	100	OPTIONAL TASK 3 SAMPLING TREATABILITY STUDY
25APR05A	29APR05A	100	RECOVERY WELL PUMP TESTS & INJECTION WELL TEST
02MAY05A	20MAY05A	100	OPT. TSK2 SITE PREDESIGN RESTORATION
02MAY05A	19MAY05A	100	DRILLING/ DEMOBE OF PHASE 1
11NOV05A	11NOV05A	100	SBMIT REVISED DRFT PLN & SPECS TO NYSDEC & RAB
14NOV05A	18JAN06A	100	REGULATOR/PUBLIC REVIEW PERIOD
Tentative Meetings			
04AUG04A	04AUG04A	100	MEETINGS W/REG/NAVY
23SEP04A	23SEP04A	100	COMMUNITY WORK SHOP
02NOV04A	02NOV04A	100	MEETINGS W/REG/NAVY
06APR05A	06APR05A	100	MEETINGS W/REG/NAVY
16JUN05A	16JUN05A	100	PUBLIC MEETING
Phase 2 Groundwater Remediation			
27APR05A	27APR05A	100	MOD AWARD

2003 2004 2005 2006 2007

J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A

Start Date	30SEP03
Finish Date	18JAN08
Data Date	28APR06
Run Date	27APR06 10.53

Early Bar
Target Bar
Progress Bar

C96P

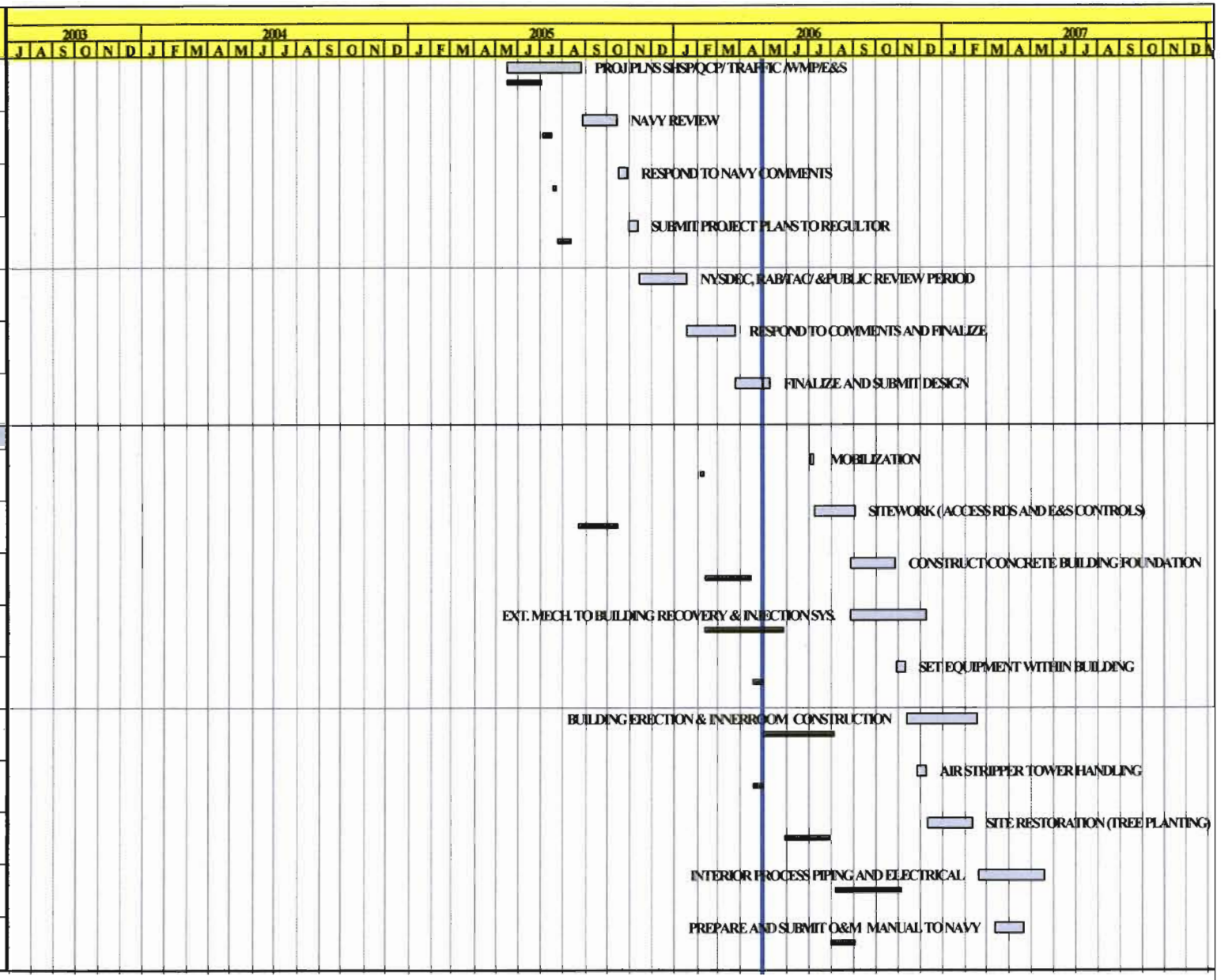
Sheet 2 of 4

CONTRACT TASK ORDER NO. 96

BETHPAGE, NEW YORK

GM-38 PUMP AND TREAT SYSTEM

Early Start	Early Finish	% Comp	
16MAY05A	26AUG05A	100	PROJ PLNS SHSP/QCP/ TRAFFIC /WMP/E&S
29AUG05A	14OCT05A	100	NAVY REVIEW
17OCT05A	28OCT05A	100	RESPOND TO NAVY COMMENTS
31OCT05A	11NOV05A	100	SUBMIT PROJECT PLANS TO REGULTOR
14NOV05A	18JAN06A	100	NYSDEC, RAB/TAC/ &PUBLIC REVIEW PERIOD
19JAN06A	23MAR06A	100	RESPOND TO COMMENTS AND FINALIZE
24MAR06A	08MAY06	72	FINALIZE AND SUBMIT DESIGN
Groundwater Remediation			
03JUL06*	07JUL06	0	MOBILIZATION
10JUL06	01SEP06	0	SITEWORK (ACCESS RDS AND E&S CONTROLS)
28AUG06	27OCT06	0	CONSTRUCT CONCRETE BUILDING FOUNDATION
28AUG06	08DEC06	0	EXT. MECH. TO BUILDING RECOVERY & INJECTION SYS.
30OCT06	10NOV06	0	SET EQUIPMENT WITHIN BUILDING
13NOV06	16FEB07	0	BUILDING ERECTION & INNERROOM CONSTRUCTION
27NOV06	08DEC06	0	AIR STRIPPER TOWER HANDLING
11DEC06	09FEB07	0	SITE RESTORATION (TREE PLANTING)
19FEB07	18MAY07	0	INTERIOR PROCESS PIPING AND ELECTRICAL
12MAR07	20APR07	0	PREPARE AND SUBMIT O&M MANUAL TO NAVY



Start Date	30SEP03
Finish Date	18JAN08
Data Date	28APR06
Run Date	27APR06 10.53

Early Bar
Target Bar
Progress Bar

C96P

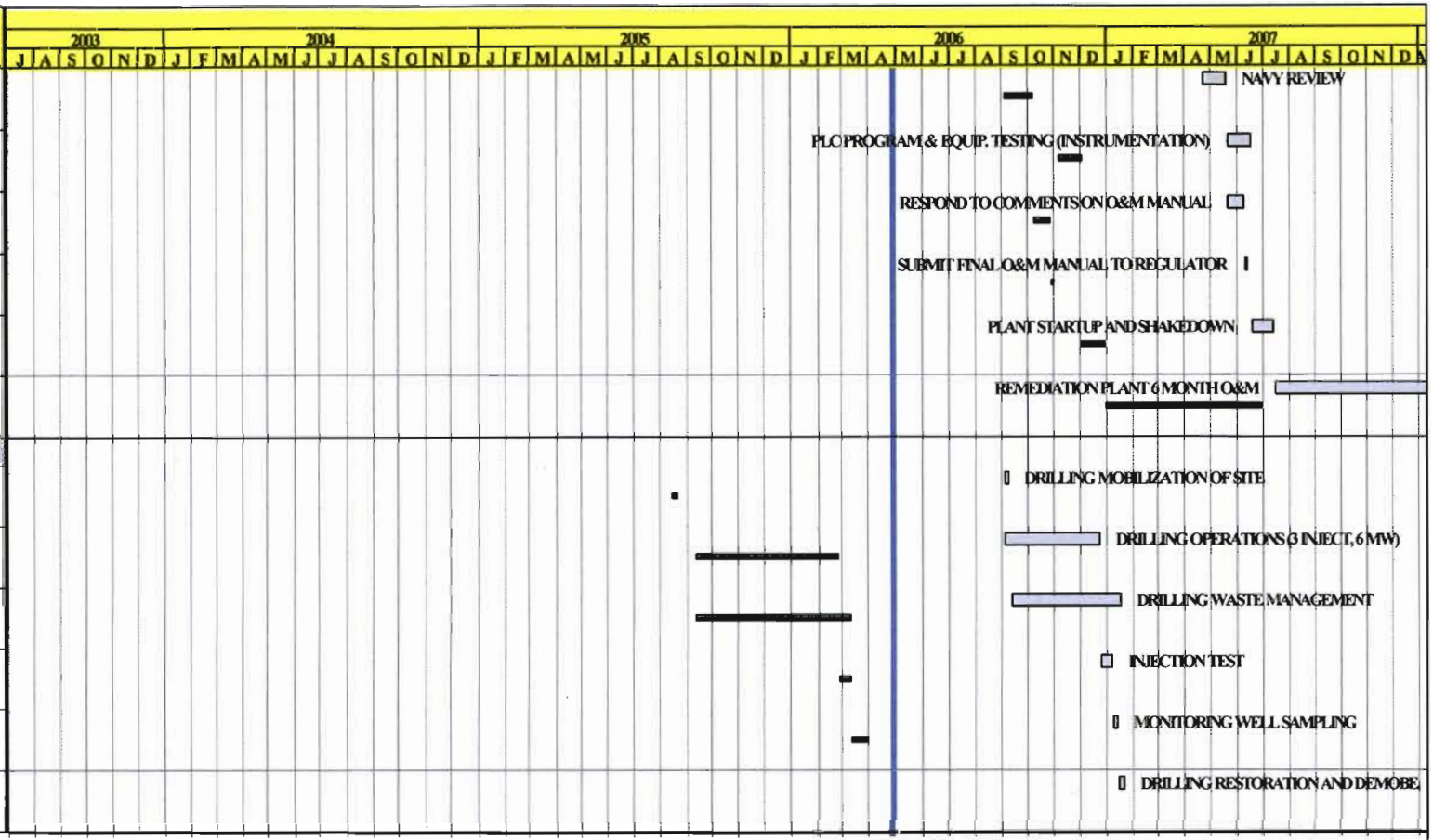
Sheet 3 of 4

CONTRACT TASK ORDER NO. 96

BETHPAGE, NEW YORK

GM-38 PUMP AND TREAT SYSTEM

Early Start	Early Finish	% Comp
23APR07	18MAY07	0
21MAY07	15JUN07	0
21MAY07	08JUN07	0
11JUN07	11JUN07	0
18JUN07	13JUL07	0
16JUL07	18JAN08	0
Drilling		
04SEP06*	08SEP06	0
05SEP06	22DEC06	0
12SEP06	15JAN07	0
25DEC06	05JAN07	0
08JAN07	12JAN07	0
15JAN07	19JAN07	0



Start Date	30SEP03
Finish Date	18JAN08
Data Date	28APR06
Run Date	27APR06 10:53

Early Bar
Target Bar
Progress Bar

C96P

Sheet 4 of 4

CONTRACT TASK ORDER NO. 96

BETHPAGE, NEW YORK

GM-38 PUMP AND TREAT SYSTEM

Appendix B

New York State Department of Transportation
Standard Specifications Section 619

618.58 M	Tar (RT-10)	Liter
618.59 M	Tar (RT-11)	Liter
618.60 M	Tar (RT-12)	Liter
618.61 M	Tar (CB-5)	Liter
618.62 M	Tar (CB-6)	Liter
618.90 M	Asphalt Emulsion Tack Coat	Liter

SECTION 619 - MAINTENANCE AND PROTECTION OF TRAFFIC

619-1 DESCRIPTION

619-1.01 General. This work shall consist of maintaining traffic and protecting the public from damage to person and property within the limits of and for the duration of the contract.

619-1.02 Basic Maintenance and Protection of Traffic. Traffic shall be maintained over a reasonably smooth traveled way which shall be so marked by signs, delineators, guiding devices and other methods that a person who has no knowledge of conditions may safely and with a minimum of discomfort and inconvenience ride, drive or walk, day or night, over all or any portion of the highway and/or structure under construction where traffic is to be maintained. All work shall conform to the requirements of the M.U.T.C.D. The basic maintenance and protection requirements shall be as follows:

A. Surface. Maintain the surface condition of the traveled way so it is consistent with the appropriate speed limit.

B. Drainage. Maintain the drainage facilities and other highway elements, old or new, including those on detours.

C. Bus Stops. Maintain existing bus stops so bus passengers are reasonably accommodated.

D. Pedestrian Traffic. Provide adequate protection for pedestrian traffic during all phases of construction.

E. Intersecting Highways. Provide ingress and egress to and from intersecting highways, homes, business and commercial establishments.

F. Dust Control and Spillage. Control dust and keep the traveled way free from materials spilled from hauling equipment. This shall also apply to dust control and spilled material resulting from the Contractor's operations in the areas outside the contract limits.

G. Flagger. Provide the necessary traffic control equipment and flaggers for adequate traffic control.

H. Repairs. Make the necessary repairs to existing pavement and structure wearing surfaces as required to provide a reasonably smooth roadway where vehicle operation is maintained.

I. Responsibility to the Public. Protect the public from damage to person and property which may result directly or indirectly from any construction operation. The specification requirements of section 107, Legal Relations and Responsibility to Public, shall apply.

J. Schedule. Schedule work to keep to a minimum, and consistent with the physical requirements of the contract, the amount of existing pavement and/or facilities that are destroyed or substantially torn-up at any one time. Unless otherwise indicated on the plans or in the proposal the length of existing facility destroyed shall not exceed two kilometers, nor shall any part be closed to traffic during seasonal shutdown periods, unless the Contractor has submitted and the Engineer has approved a detailed schedule of operations reflecting a proposal to the contrary.

K. Snow and Ice Control. Maintain the traveled way in such a condition and conduct operations in such a manner that snow and ice may be readily controlled by others as and when necessary, and in such a manner that proper drainage is provided for the melting of snow in the banks resulting

from normal plowing. This shall include, but not be limited to, the cutting of weeps through banked or accumulated snow to provide proper drainage of surface runoff into the highway ditches and/or culverts. The Contractor shall not, however, be responsible for snow and ice control on the pavement or shoulders.

L. Delineation and Guiding Devices. Provide and maintain delineation and channelization devices which shall include delineators, plastic drums, cones, temporary curb 300 x 300 mm and smaller exposed section, and other similar materials or methods acceptable to the Engineer.

The installation, moving and removing of any such delineators or channelization devices together with removal of existing pavement markings shall be included in the work.

M. Project Site Patrol. The Contractor shall provide personnel to patrol the contract area as necessary to ensure that conditions on the site are adequate for public safety and convenience at all times. The Contractor is placed on notice that maintenance and protection of traffic over a highway during construction is considered as important as the construction itself. The Contractor shall, therefore, at all times conduct the operations in a manner to ensure the convenience of all travelers and the abutting property owners and their safety as well as the safety of the Contractor's own employees.

Such conduct shall include, but not be limited to: ensuring that all construction materials and equipment are removed from the work site during non-working hours, or are protected in such manner that they shall not constitute a traffic hazard; conducting the operations in such a manner as to minimize the amount of time during which fixed objects and steep side slopes are without guide rail protection; conducting shoulder construction and paving operations in such a manner as to minimize the period of time the traveling public is exposed to sharp dropoffs; and not allowing workers to park personal vehicles in the shoulder area on roads with operating speeds less than 70 km/h and within ten meters of the traveled way on other roads, unless protected by barrier.

N. Shadow Vehicle. For purposes of these specifications, a shadow vehicle is defined as a slowly moving or stopped vehicle operating or placed in a traffic lane, or adjacent thereto, upstream of a construction work zone. The purpose of shadow vehicles is to guide traffic around a construction work area or to reduce the possibility of harm to workers in the work area. Shadow vehicles shall be required when shown on the plans or for all slowly moving work areas in travel lanes, except where the travel lane is closed to traffic by barrier, barricades, plastic drums, arrow panels, flagpersons or cones. Slowly moving work areas are those which move at a speed of 2km/h or more but at least 25km/h less than the legal speed limit. Shadow vehicles shall weigh 8200 kg to 9100 kg. Ballast may be used to bring a lighter weight vehicle up to the indicated weight. Shadow vehicles shall be equipped with Mobile Construction Zone Impact Attenuators, §712-06 and one Type B Arrow Panel as described in the M.U.T.C.D. On roads with posted speed limits of 65 mph within 335 meters upstream of the shadow vehicle, or whenever indicated on the plans or in the proposal, the Mobile Construction Zone Impact Attenuator shall be listed as a National Cooperative Highway Research Report 350 Test Level 3 device on the Approved List. On other roads the attenuator shall meet the requirements of NCHRP 350 Test Level 3 or Test Level 2, NCHRP 230, or other testing protocol as stated in §712-06.

619-1.03 Construction Signs, Temporary Box Beam Barrier, Temporary Concrete Barrier, Construction Barricades, and Lighting for Construction Barricades. The Contractor shall furnish, install, move, and maintain construction signs, temporary box beam barrier, temporary concrete barrier, construction barricades, and lighting for construction barricades where shown on the plans or when ordered by the Engineer, and in accordance with the M.U.T.C.D.

619-1.04 Temporary Structures and Approaches. The Contractor shall construct,move or remove, as directed, temporary structures, approaches, detours, pavements and necessary appurtenances.

619-1.05 (Vacant).

619-1.06 Short-Term Pavement Markings. Short-term pavement markings are intended for use on any new pavement or milled surface until the subsequent pavement course is placed or the final pavement markings are installed. The Contractor shall furnish, apply and when so ordered, remove short-term pavement markings where shown on the plans, or directed by the Engineer, in accordance with these specifications.

619-1.07 Temporary Traffic Signals. The Contractor shall furnish, install, move, remove and maintain temporary traffic signals and necessary components where indicated on the plans or as directed by the Engineer. The temporary traffic signals and necessary components that are furnished by the Contractor shall remain the property of the Contractor.

619-1.08 Mailboxes. During construction, the Contractor shall maintain in a usable condition and location specified by U.S. Postal requirements, postal route mailboxes serviced from motor vehicles.

619-1.09 Opening Highway to Traffic Prior to Contract Acceptance. This work includes the maintenance and protection of traffic on any portion of pavement, structure, or ramp directed in writing by the Regional Director to be opened to traffic prior to contract acceptance and on which traffic was not specified to be maintained and protected during construction. Pavement sections on new locations which are indicated to be used in the maintenance of traffic plan or which are requested by the Contractor to be used to maintain traffic, shall not fall in this category.

619-1.10 Railroad Protection. Where the contract work affects railroad companies, the maintenance and protection of traffic requirements specified in §105-09, Work Affecting Railroads and special provisions of the contract proposal shall apply.

619-1.11 Duration of Contract. The duration of the contract, for the purpose of this work, shall be from the date any work is started on the contract, including moving in equipment, signs, offices, shops and the like, until the date the contract is officially accepted.

619-1.12 Maintain Traffic Signal Equipment. The Contractor shall maintain in proper operation, existing, relocated, modified or newly installed traffic signals indicated in the contract documents or directed by the engineer for the period specified in the contract documents.

619-1.13 Flashing Arrow Board. Furnish, install, maintain and remove Flashing Arrow Board warning devices in accordance with plans, NYS Manual of Uniform Traffic Control Devices or the directions of the Engineer. Flashing arrow boards are intended for use as temporary traffic warning devices during construction and obstruction periods, and under this item the Contractor shall provide Flashing Arrow Boards made necessary by the operations. The number and type required shall be the number and type necessary, in accordance with the criteria given below, to satisfactorily guide traffic through the construction. The actual number will depend on the Contractor's sequence of operations.

619-1.14 Construction Zone Pavement Markings. The Contractor shall furnish, apply, maintain and remove construction zone pavement markings conforming to the NYSMUTCD at the locations, and in accordance with the patterns, indicated in the contract documents or directed by the Engineer. These pavement markings are intended for use in detours, temporary pavement realignments and crossovers, lane shifts and closures, and other temporary traffic patterns associated with the construction activities.

619-1.15 Maintenance and Protection of Traffic During Nighttime Operations. Nighttime operations consists of work specifically scheduled to occur after sunset and before sunrise. In addition to the requirements of basic maintenance and protection of traffic, additional requirements for maintenance and protection of traffic during nighttime operations shall be as follows:

A. Traffic Control Supervision. The Contractor shall provide a full-time traffic control supervisor for nighttime operations with adequate training, experience, and authority to implement and maintain all traffic control operations. The traffic control supervisor must be approved by the

Engineer based on a written request by the Contractor detailing the training and experience of the traffic control supervisor. The traffic control supervisor shall be assisted by a full-time traffic control crew equipped with a suitable vehicle or vehicles and a mobile communications system consisting of radios or cellular phones. The duties and responsibilities of the traffic control supervisor shall be included in the plan of nighttime operations. During setup and removal of lane closures and other traffic control setups, the traffic control supervisor and crew shall be assisted by additional workers as necessary.

B. Plan of Nighttime Operations. Thirty days prior to the start of night work, the contractor shall submit a written plan for nighttime operations to the Engineer. The plan shall detail all aspects of the traffic control setup; lighting plans; the functions, responsibilities and identities of the traffic control supervisor and crew; and other details as necessary. It shall include a contingency plan identifying foreseeable problems and emergencies that may arise, and the approach that will be used to address them. This plan shall be revised and updated by the contractor as necessary during the progress of the work to accommodate actual conditions on the project.

C. Project Site Patrol. During nighttime operations, the traffic control supervisor and crew shall constantly patrol the contract area to ensure that conditions on the site are adequate for public safety and convenience at all times, to ensure worker safety from intrusions into the worksite, and to ensure that the provisions for maintenance and protection of traffic in the contract documents and in the plan for nighttime operations are adhered to. The traffic control crew shall maintain and adjust signs, channelizing devices, area lighting and other traffic control devices as necessary.

D. Waiver of Requirements. When the work does not require closure of an active lane, roadway, or ramp and when no construction operations occur adjacent to active traffic lanes; the requirements for a full-time traffic control supervisor and full-time project site patrol shall be waived. However, the contractor shall provide a competent supervisor and workers to install, maintain, adjust, and remove traffic control devices as required by the work operations. The details of the supervision and site patrol to be provided under this waiver shall be included in the plan of nighttime operations.

E. Trained Flaggers. All flaggers used in nighttime operations shall be formally trained in flagging operations. This training may consist of ATSSA (American Traffic Safety Services Association), Union, or trade association training, or training by an individual who has received formal training from a recognized program or agency in work zone traffic control. Prior to the start of work, the contractor shall provide the Engineer with a written summary of training for each individual flagger. When requested by the Engineer, flaggers shall demonstrate their competency in flagging procedures. Flaggers not thoroughly competent in flagging procedures to the satisfaction of the Engineer shall be replaced at once.

F. Emergency Flares. A supply of emergency flares shall be maintained by the Contractor for use in the event of unanticipated situations such as traffic accidents, equipment breakdowns, failure of lighting equipment, etc.

619-2 MATERIALS. All materials used shall comply with the requirements of the appropriate subsections of Section 700, Materials, or as established by this section, the applicable standard sheets or the plans.

619-2.01 Existing Pavement Repair. Existing pavements shall be kept in repair using materials compatible with the pavement. In general, plant-mixed bituminous concrete is suitable for all pavement surfaces. Material other than plant-mixed bituminous concrete may be used if approved by the Engineer.

619-2.02 Construction Signs, Other Signs, and Sign Covers. Rigid sign panels may be aluminum, fiberglass, galvanized steel, or plywood, except that sign panels placed on Type III Breakaway Barricades shall be aluminum.

Rigid lightweight plastic may also be used for sign panels, but not for panels larger than 1200 X

1200 mm. The rigid lightweight plastic substrate shall consist of at least two parallel surfaces of plastic separated by plastic foam or stiffener/spacers. A single piece plastic extrusion simulating this construction will also be acceptable. External stiffeners may be used to prevent warping and excessive flexing, or to attach the panel to posts. If through bolting is used to attach the panel to stiffeners, or to attach the panel directly to the posts, the bolt heads shall be provided with clear washers to minimize obscuring the legend. The rigid lightweight plastic substrate, plus any external stiffeners, shall not have a combined mass of more than 6 kg/m2.

On rigid panels, all colors of sign faces, except orange, shall be reflectorized and meet the requirements of §730-05 Reflective Sheeting, Materials Designation 730-05.02 (Class B). When orange signs on rigid panels are specified they shall be fabricated using reflectorized fluorescent orange colored sheeting meeting Materials Designation 730-05.04 (Class D).

Flexible sign panels shall be a solid, orange colored, durable elastomeric material. Flexible sign panels fabricated from mesh will not be allowed.

Flexible signs shall be orange in color and a reasonable visual match to Munsell Book Notation 2.5 YR 5.5/14. The orange color flexible panels shall be approved by the Engineer prior to use. Flexible sign panels need not be reflectorized.

Black sign characters shall be non-reflective, and shall conform to the requirements of §730-13 Reflectorized Sheeting Sign Characters (Type V).

White sign characters shall meet the requirements of either §730-12 Reflectorized Sheeting Sign Characters (Type IV) or §730-13 Reflectorized Sheeting Sign Characters (Type V).

Covers used to inactivate unneeded signs shall match the size and shape of the sign and shall cover the entire sign face. More than one layer of fabric may be required to prevent legibility of the sign legend to be covered. The covers shall be a heavy duty, opaque material; and dark green, brown, or black, in color. The sign cover shall be attached to the sign in a secure manner using straps or other means approved by the Engineer. The finished sign covers shall be neat in appearance, with all fasteners secured on the backside of the sign face.

619-2.03 Delineators, Temporary Box Beam Barrier, Temporary Concrete Barrier, Construction Barricades, Lighting for Construction Barricades, Tubular Markers, and Short-Term Pavement Markings. Delineators, barricades, lighting for construction barricades, short-term pavement markings, tubular markers and similar materials shall meet the requirements of these specifications and shall be in accordance with the plans, applicable standard sheets and the M.U.T.C.D. No materials or methods which will cause damage to any pavement or paving course that will be retained shall be employed in the removal of pavement markings.

Tubular markers shall meet the requirements of §730-09 Tubular Markers for Construction Zone Channelization. Tubular markers and cones purchased after October 1, 1998 shall be certified by their manufacturers or vendors as complying with NCHRP 350 testing requirements. The basis for such certifications shall be full or simplified crash testing or satisfactory in-service performance of identical or similar devices.

Temporary box beam barrier shall meet the requirements of box beam median barrier as specified in §710-21 Box Beam Guide Railing and Median Barrier. After the removal of the barrier, the pavement repairs shall be made in accordance with the applicable requirements of Section 402 - Hot Mix Asphalt (HMA) Pavements or Section 502 Portland Cement Concrete Pavement.

Temporary concrete barriers shall conform to the dimensions, joint connections, materials details, and anchoring details shown on the standard sheet or approved material details. The barrier sections shall be precast concrete units. The Manufacturer shall certify that the temporary concrete barrier units conform to the details shown on the standard sheet or approved materials details.

The details for temporary concrete barrier shown on the standard sheet or approved materials details are standard. Designs, other than those shown on the standard sheet or the approved materials details, may be proposed and, if found acceptable, they will be placed on the approved list. No variation in the method of connecting the units together will be approved unless evidence that the temporary concrete barrier, with the proposed joint system, has been successfully crash tested by a recognized testing agency. The test vehicle shall be smoothly redirected without showing any evidence of penetrating or

vaulting. The tests shall be conducted in accordance with NCHRP 350 under the following criteria:

1. Test vehicle shall be the 2000P
2. Impact angle 25° ±2°.
3. Impact speed 100 km/h.

In no case shall the tested deflection of the barrier exceed 400 mm.

The cross sectional dimensions shown on the standard sheet shall be used in all cases without variation.

The Engineer will inspect the temporary concrete barrier sections upon delivery to the project site for conformance to specifications. Any barrier sections having damage and/or defects in the concrete and/or joint connections will be rejected by the Engineer when, in the Engineer's judgement, the performance of the barriers will be affected.

The temporary concrete barrier sections shall form a smooth and continuous barrier when joined together. Any sections damaged or misaligned while in service shall be corrected or replaced to the satisfaction of the Engineer.

When reflectorization is required by the M.U.T.C.D. reflective sheet material shall be used and it shall conform to §730-05, Reflective Sheeting, Material Designations 730-05.02 (Class B) or 730-05.03 (Class C), except where glass or plastic buttons are used as delineators. Construction barricades, cones and drums may be reflectorized with reflective sheeting conforming to the requirements of §730-05, Reflective Sheeting, Materials Designation 730-05.01 (Class A). All traffic cones 700 mm in height, when used after dark, shall have two (2) white horizontal stripes of reflective material near the tip. The reflective material shall conform to the requirements of §730-05 Reflective Sheeting, Class A, B or C. The upper stripe shall be 150 mm wide with its upper edge 75 to 100 mm below the top of the cone. The lower stripe shall be 100 mm wide with its upper edge 50 mm below the upper stripe.

When reflectorization is not required, any paints utilized shall be of an exterior type conforming to the appropriate Highway Color Tolerance Chart PR Colors No. 1 through No. 6. These requirements must be maintained throughout the period of the contract with repair or replacement made by the Contractor as necessary.

Short-term pavement markings shall consist of reflectorized pavement marking paints, removable reflectorized pavement marking tape, non-removable reflectorized pavement marking tape, or removable raised reflectorized pavement markers. Removable reflectorized pavement marking tape and raised reflectorized pavement markers shall be selected from the Department's Approved List of "Removable Reflectorized Pavement Markings". Pavement marking paints shall meet the material requirements of Section 640 Reflectorized Pavement Marking Paints. Non-removable pavement marking tape shall be specifically designed for use as a pavement marking and shall be approved by the Engineer prior to application. All line segments shall be not less than 100 nor more than 150 mm in width and the colors shall be as specified in the M.U.T.C.D.

619-2.04 Temporary Structures and Approaches. When specific details are shown on the plans for temporary structures, the materials specified shall be used, except that substitutions or alterations may be permitted if approved by D.C.E.S. Mill inspection will not be required for structural steel furnished under this item. Certified copies of the manufacturer's test results shall be submitted to the Engineer. When specific details are not shown on the plans, the Contractor shall assume all liability and responsibility for determining that all materials required conform to the current AASHTO specifications for Highway Bridges unless otherwise approved by the DCES. Used material shall not be furnished for Fracture Critical Members. Excluded from this provision are pedestrian and pre-engineered (fabricated) proprietary structures.

619-2.05 Temporary Traffic Signals. All span wire, inductance loop wire, shielded lead-in cable, traffic signal cable, and other wire used for temporary traffic signals shall be new material meeting the applicable requirements of §680-2 of the Standard Specifications.

All other equipment for temporary traffic signals shall meet the requirements of §680-2 of the Standard Specifications except for the following modifications:

A. Used Equipment. Used equipment in good operating condition may be furnished to provide the required operation of the signals.

B. Manufacturer's Certification. Manufacturer's certification of compliance will not be required.

C. Signal Controller. The signal controller may be either solid state or electro-mechanical.

D. Traffic Signal Heads. The material and painting requirements of §724-04 Traffic Signal Heads, shall not apply except that the signal head housing shall be made of aluminum alloy and shall be painted with an exterior dark green enamel paint or epoxy powder coating.

E. Conflict Monitor. Means shall be provided to prevent the signal from displaying indications which will result in two or more conflicting traffic movements being permitted simultaneously.

619-2.06 Type III Construction Barricades. Type III construction barricades shall meet the requirements of the following specifications:

A. Barricade Frames. Barricade frames for Type III construction barricades shall meet the requirements of the following specifications:

1. PVC Pipe Barricade Frames for Alternate "A" and "B". PVC Pipe barricade frames shall be fabricated from plastic pipe conforming to the following table:

TABLE OF ACCEPTABLE MATERIALS FOR PVC PIPE BARRICADES

NPS DESIG-NATION	PIPE		FITTINGS	
	A.S.T.M.	*SDR RANGE	ALTERNATE A	ALTERNATE B
3	D2241	21.0 TO 32.5	D2665 OR D2466	D2468, D2661, D2665, D2466
3	D2665	---	D2665 OR D2466	D2468, D2661,D2665, D2466
3-½ **	D2241	21.0 TO 41.0	D2466	D2468,D2466
4 **	D2241	21.0 TO 64.0	D2665 OR D2466	D2468, D2661, D2665, D2466
4	D2665	---	D2665 OR D2466	D2468, D2661, D2665,D2466
4	D2729	---	D2729	D2729

* SDR (Standard Dimension Ratio) as specified in the various A.S.T.M. Designations.

** NPS 3-½ OR 4 A.S.T.M. D2241 SDR 21 to SDR 26 shall be used on barricades which are extended for sign mounting. These pipes shall not be used on other barricades.

All joints in Alternate "A" shall be glued with a solvent cement compatible with the pvc pipe chosen by the Contractor.

All joints in Alternate "B" shall be free to separate upon vehicle impact. Pipes and fittings shall be tied together with a braided nylon rope as shown on the Standard Sheet.

2. Metal Barricade Frames for Alternate "M". Square tubing for the Alternate "M" barricades shall be either perforated or unperforated steel conforming to one of the following:

12 Ga. ASTM A653M Grade A
14 Ga. ASTM A1011 Grade 50

The brackets shall be fabricated from 6 mm plate conforming to ASTM A653M Grade A or ASTM A1011 Grade 50.

The bolts shall be ASTM F568 Class 4.6 and the nuts shall be ASTM A563M Grade 0. Both the nuts and the bolts shall be galvanized in accordance with the requirements of §719-01 Type II.

The Contractor may at its option supply ungalvanized square steel tube and brackets. However, any rust which may, as determined by the Engineer, impair the collapse of the barricade upon impact may result in the rejection of the barricade unit.

3. Polyethylene Barricade Frames for Alternate "C". Base and upright for the Alternate "C" barricade shall consist of molded medium density polyethylene tubing meeting the requirements of ASTM D1248-IIA3. The angled brace shall consist of extruded high density PE meeting the requirements of ASTM D1248-IIIA4. Polyethylene tubing and miscellaneous hardware shall be of the dimensions and sizes indicated on the standard sheets. All joints in the PE components shall have tight friction fits designed to withstand normal wind and construction site conditions but to separate on impact.

B. Panels for Rails or Signs. Barricade rails and signs mounted on the barricade shall be aluminum or high density polyethylene (HDPE) panels . Aluminum rail and sign panels shall be 0.635 and 3.2 mm thick respectively and shall conform to the requirements of §730-01 Aluminum Sign Panels. HDPE panels shall be 3.2 mm nominal thickness and shall conform to the requirements of ASTM D1248-IIIA5.

The three rails of the barricade shall have 150 mm wide reflectorized orange and white diagonal stripes sloping at an angle of 45°. The stripes shall slope downward toward the side on which traffic is to pass. The reflective sheeting for the stripes shall conform to the requirements of §730-05 Reflective Sheeting, Materials Designation 730-05.01 (Class A) or 730-05.02 (Class B) or 730-05.03 (Class C) at the Contractor's option.

619-2.07 Maintain Traffic Signal Equipment. All traffic signal hardware including but not limited to wire, cable, conduit, pullboxes, switchpacks, modules and relays, signal heads, poles, and pedestrian push buttons used to maintain proper operation shall meet the applicable requirements of §680-2 materials. Parts and materials which are to continue in operation beyond the contract duration shall be new.

619-2.08 Flashing Arrow Board. The Flashing Arrow Boards shall be trailer mounted self contained units or, with permission of the Engineer, truck mounted self-contained units. Flashing Arrow Boards shall display a flashing symbol consisting of flashing yellow lights arranged on a panel to form an arrow.

The arrow panel shall consist of 1200 X 2400 mm rectangular solid panel finished in non-reflective black, and shall be mounted so that the bottom of the panel is a minimum of 2.1 m above the roadway. The arrow indication shall cover the entire area of the panel, and shall be composed of lamp units with five lamps in the arrowhead and five lamps in the shaft.

Lamps shall be arranged and controlled to provide the following mode selections: Left Arrow, Right Arrow, Left and Right Arrow, and Caution. In the three directional modes, the lamps in the shaft next to the arrow point shall not illuminate. The caution mode shall consist of either two pairs of alternately flashing lamps arranged in a pattern that does not indicate direction, or four lamps simultaneously flashing in each of the four corners of the board. The rear face of the arrow panel shall contain one or more clear lamps to indicate that the arrow board is operating properly. Arrow panel operation controls shall be mounted in a lockable enclosure.

The lamps shall flash at a rate of not less than 25 nor more than 40 flashes per minute with a minimum lamp "on time" of at least 50 percent of the cycle. The lamps shall be recess mounted or alternatively equipped with an upper hood of not less than 180 degrees. The lamps shall be equipped with an automatic solar cell controlled dimming switch activated at a level of approximately five candellas. The solar cell dimming switch shall be equipped with a delay to prevent undesirable actuation from car lights. The dimming voltage to the lamps shall be manually controllable over a five to twelve volts effective range.

Flashing Arrow Boards shall be powered by line voltage, diesel motor generator system, or by a solar charged battery system. Boards powered by diesel motor generator system shall be capable of sustained operation for 72 continuous hours at normal operating voltage. Solar charged arrow boards shall be capable of continuous operation on battery power only for the same period at normal operating

voltage. The flashing arrows of diesel or line powered boards shall be legible at a minimum distance of 1600 meters on a bright sunny day or a clear night. The flashing arrows of solar charged boards shall be clearly legible continuously from any point on the traveled way or shoulder from the beginning of the lane closure taper to an upstream distance of 500 meters on a bright sunny day or a clear night.

619-2.09 Plastic Drums. Plastic Drums may be used for channelization devices, provided they are of the proper size and reflectorized as indicated in the M.U.T.C.D. Plastic drums purchased after October 1, 1998 must be certified by their manufacturers or vendors as complying with NCHRP 350 testing requirements. The basis for such certifications shall be full or simplified crash testing or satisfactory in-service performance of identical or similar devices. The plastic drums shall have provisions for the installation of ballast (weights) or retainer rings to prevent the drums from blowing over due to wind loading. The ballast or retainer rings must be designed to separate from the drum on impact. The ballast shall be located at or near ground level and consist of bagged sand, or other material approved by the Engineer, weighing no more than 22 kilograms. The sand shall be contained in waterproof closed bags or in a waterproof compartment of the device specifically designed for the purpose. For two-piece drums, only the base shall be detachable no more than 100 mm above the pavement. For one-piece drums, the base shall be elongated to accept ballast on one or more sides. No open or top metal drums will be permitted.

619-2.10 Construction Zone Pavement Markings. These markings shall consist of reflectorized pavement marking paints, removable reflectorized pavement marking tape, or removable raised reflectorized pavement markers. Pavement marking paints shall meet the material requirements of §640-2. Removable reflectorized pavement marking tape and raised reflectorized pavement markers shall meet the requirements of §727-02 and shall be selected from the Department's Approved list of "Removable Reflectorized Pavement Markings." All longitudinal line segments shall be not less than 100 mm nor more than 150 mm in width and colors shall be as specified in the MUTCD and shown on the plans.

The type of pavement marking material to be supplied shall be as required by the pay item. In the case of the "Optional Construction Zone Pavement Markings" pay items, the Contractor may select the type of material to be used from the choices permitted in the preceding paragraph, except that reflectorized pavement marking paint shall not be used on any top pavement course that is to remain in place without overlaying at the completion of the project, except where the location of those markings coincide with final painted pavement markings. Raised reflectorized pavement markers shall not be used to simulate marking letters or symbols.

619-3 CONSTRUCTION DETAILS

619-3.01 Basic Maintenance and Protection of Traffic. Under this work, the Contractor shall maintain and protect traffic in accordance with the following:

A. General. The Contractor shall generally provide a traveled way suitable for two lanes of moving traffic, or more lanes if shown on the plans, or in the proposal. The traveled way shall be kept reasonably smooth and hard at all times, and shall be well drained and free of potholes, bumps, irregularities and depressions that hold or retain water. Construction operations shall be conducted to insure a minimum of delay to traffic. Stopping traffic for more than five minutes shall not be permitted unless specifically authorized in writing by the Engineer. The necessary equipment and personnel to attain and maintain a satisfactory riding surface shall be available and used as needed at all times when work is under way and when work is temporarily suspended for any period of time. Special attention to maintenance of a satisfactory traveled way shall be given during weekends, holidays and the winter season.

B. Cleaning of Highways. The Contractor shall keep the traveled way free of foreign objects such as spilled earth, rock, timber and other items that may fall from transporting vehicles. Materials spilled by or dropped from the undercarriage of any carrying vehicle used in the Contractor's hauling operations along or across any public traveled way both within and outside the contract limits shall be removed immediately.

C. Dust Control. Dusty conditions resulting from the Contractor's operations shall be corrected by the use of calcium chloride and/or water. Water used as a dust palliative shall be distributed uniformly over a minimum width of 2400 mm by the use of suitable spray heads or spray bar.

Nothing in these specifications shall preclude the use of a dust palliative which has been evaluated and found to be environmentally compatible and is used in conformance with any conditions placed on its use. This use shall be at no additional cost to the State and as approved by the Engineer. A list of acceptable dust palliatives is available from the Director, Geotechnical Engineering Bureau or a Departmental Soils Engineer.

D. Traffic Control. Whenever it becomes necessary to maintain traffic on one lane, the Contractor shall provide adequate traffic controls on the section of highway on which vehicle operation is maintained. The Contractor shall employ a sufficient number of competent flagpersons and/or temporary traffic signals to control one lane traffic continuously. In the event the length of the one lane operation is extremely short and conditions are favorable for safe operation, the Engineer may, in writing, authorize the Contractor to dispense with flaggers or traffic control signals. The Contractor shall also provide a sufficient number of competent flaggers in areas where construction equipment is operating in potential conflict with public traffic, regardless of the volume of traffic or the sight distance. Flaggers shall wear orange hard hats meeting current OSHA standards for impact, electrical shock, and burn protection and vests in conformance with the M.U.T.C.D., and shall direct traffic in conformance with said manual. Signal Paddles meeting the requirements of Section 293.2 of the MUTCD shall be used as the standard signaling device for flagging operations where one or more flaggers are controlling a single stream of traffic, or two alternating streams of traffic proceeding in opposite directions. Signal flags may be substituted where display of the STOP and SLOW faces in opposite directions may be inappropriate or misleading, or in other situations, when approval is granted by the Engineer.

E. Drainage. The Contractor shall devote particular attention to all drainage facilities, keeping them fully operative at all times. Ditches shall be provided at all times, even during grading operations and periods of accumulated plowed snow, to adequately drain the traveled way and the remainder of the right-of-way areas.

F. Ingress and Egress. The Contractor shall provide and maintain, at all times, safe and adequate ingress and egress to and from intersecting highways, homes, business and commercial establishments at existing or at new access points, consistent with the work, unless otherwise authorized by the Engineer. The Contractor will not be responsible for snow removal from driveways or entrances. On highways on which motor bus service is maintained, the Contractor shall provide suitable areas or locations for the loading and unloading of passengers. The existing pavement, at improved intersecting streets, shall not be disturbed without prior consent of the Engineer.

G. Channelization, Delineation, Pavement Edge Drop-off Protection. The Contractor shall furnish, erect, move, maintain and remove delineators, channelizing devices, and traffic barrier as required by the contract documents and as directed by the Engineer. In areas where grading is being done, a safe and easily traveled roadway shall be properly marked at all times either by the use of delineation and channelizing devices or flaggers. Where private driveways, pedestrian or handicapped facilities exist, the entire access area shall be kept safe and smooth for convenient ingress and egress. Any area determined by the Engineer to be particularly hazardous shall be marked by the use of flashing warning lights conforming to the requirements of the MUTCD in addition to the channelizing or delineation devices.

1. Channelization. Channelizing devices shall be provided as shown in the plans and proposal, or as required by the Engineer, to physically separate traffic from the portion of roadway not available for travel, and to mark the limits of the roadway that is available for travel. Channelizing devices shall consist of cones, plastic drums, tubular markers, Type III

Barricades, or vertical panels. The design and usage of these devices shall conform to the requirements of the MUTCD.

The placement and spacing of these devices in tapers shall not exceed the values given in the MUTCD. Along pavement edge drop-offs, placement and spacing shall be in accordance with Table 619-1 of these specifications. At locations other than tapers and pavement edge drop-offs, unless specific placement and spacing of devices is shown in the contract documents, the placement and spacing between devices shall be selected by the Contractor subject to the Engineer's approval. The spacing shall be sufficiently close to clearly indicate the intended path through the work zone and the portions of the roadway not available for use. If, after deployment of the selected devices, the Engineer is not satisfied that the spacing and placement is sufficient, the Engineer may direct that a different spacing be used.

All channelizing devices shall be maintained upright, in proper alignment and orientation, and kept clean at all times. If ballast is used to maintain alignment and position of the devices, it shall consist of dry sand or other material approved by the Engineer, and placed at ground level. The sand shall be contained in waterproof closed bags or in a waterproof compartment of the device specifically designed for the purpose. Under no circumstances shall ballast be placed on top of a drum or at any point above ground level on any of these devices. If plastic drums are used, they shall be two-piece devices with detachable bases or one-piece devices with elongated bases provided to hold the ballast. In the case of one-piece devices, the ballast shall be placed on the side from which traffic approaches. In no case will the use of steel drums or open-top plastic drums be permitted. Where warning lights are attached to the channelization devices, a bolt, nut and washer shall be used for the attachment as recommended by the manufacturer, and the battery should be located at ground level.

2. Delineation. If post-mounted delineators are used, they shall be securely mounted and placed in accordance with the requirements of the MUTCD. They shall be placed only behind curbing or to mark the outside limits of usable shoulders. Post-mounted delineators are not required to be installed behind channelizing devices, but such an installation is not prohibited. Other delineators for mounting on traffic barriers or other purposes may be circular or rectangular in shape and shall be constructed of reflective sheeting having a minimum area of 12 900 square millimeters or a reflective button having a minimum diameter of 75 mm.

3. Drop-off Protection. For drop-offs within three meters of the travel lanes, except bridge drop-offs or other drop-offs in excess of 1.8 m deep, the Contractor shall provide traffic protection in accordance with the provisions of Table 619-1, "Required Protection for Pavement-edge Drop-offs" and its accompanying notes, unless otherwise shown in the Contract documents. In all cases, construction operations shall be conducted so as to minimize to the extent practicable the time, depth, and length of drop-offs to which motorists are exposed. At the close of work each day, the Contractor shall provide the treatment shown in Table 619-1. At the time a drop-off condition first occurs, the protection treatment shall be installed based on the anticipated number of days the traffic will be exposed to the drop-off. The anticipated exposure time shall be determined by the Contractor, subject to verification by the Engineer. If at any time subsequent to installation of the protection treatment, the Engineer determines that the anticipated exposure time is likely to increase such that additional protection is required, that increased protection shall be installed as soon as practicable, and it shall be based on the revised anticipated exposure time measured from the first day the drop-off condition existed. In addition, "LOW SHOULDER" or "NO SHOULDER" signs, as appropriate, shall be used for all drop-offs within 1.5 m of the shoulder edge. For long drop-offs, these signs shall be placed beyond intersections and at spacing not exceeding 300 meters. For drop-offs less than 50 mm deep, the "LOW SHOULDER" sign will not be necessary after edge lines are installed.

If a ramp is required by Table 619-1, it shall be constructed from the pavement surface to the surface of the excavated area using a slope not steeper than the slope shown in the table. Ramp material shall be erosion resistant, fully compacted, and compatible with the material in

the excavated area. At the Contractor's option, a preformed ramp may be used provided it is adequately anchored to the underlying course. Unless indicated otherwise in the plans or permitted in writing by the Engineer, channelizing devices or positive barrier used to protect drop-offs shall not intrude into the travel way to the extent that they reduce available lane width to less than 3 meters on roadways with actual operating speeds of 70 km/h or less or 3.35 m on all other roadways. Channelizing devices may be placed in the drop-off area only for depths of up to 150 mm if their placement on the roadway would reduce lane widths below the values specified above. For drop-offs deeper than 150 mm, the channelizing devices must be placed entirely on the pavement.

If the Contractor's operations are scheduled or delayed such that positive barrier is required by Table 619-1, or if the Contractor chooses, with written approval from the Engineer, to provide a positive barrier in lieu of the treatment shown in Table 619-1, the barrier shall be installed at no additional cost to the State. The positive barrier shall meet all the requirements of the Standard Specifications and Standard Sheets for temporary concrete barrier. (Box Beam Guide Railing or Heavy Post Blocked-Out Corrugated Beam Guide Rail may be used if approved in writing by the Engineer and the distance from the back of the rail to the drop off is at least 1.2 m for the corrugated beam rail and 1.5 m for the box beam.) Any anticipated or proposed use of positive barrier by the contractor shall require submittal of a plan for approval by the Regional Director. The plan shall include barrier type, location, terminal and end treatment, and any necessary traffic control devices such as signing, barricades, channelizing devices etc in accordance with the MUTCD. The contractor shall construct his plan under the following guidelines.

Approach ends of positive barrier shall be flared at the taper rate shown in Table 619-2. When operating speeds are over 65 km/h, an approved safety terminal or sand barrel array will be required on approach ends of temporary concrete barrier when the offset from the edge of traveled way to end of the full section barrier is less than 3.7 m. In traversable medians, gores and other areas where impacts on a tapered concrete end section could allow vehicles to penetrate into opposing or adjacent lanes of traffic, the use of the tapered concrete end section is prohibited. Box beam and heavy post blocked-out corrugated beam guide rail shall be anchored with the appropriate end assemblies and anchorage units shown on the standard sheets for these systems. Alternate methods of terminating positive barrier such as connecting to existing barrier or shielding behind other barrier will be considered for approval. If a work zone crash cushion is used, any work zone crash cushion purchased after 10/1/98 must comply with NCHRP 350. The test level shall be as indicated in §712-06. Work zone crash cushions purchased before 10/1/98 may be phased out as they complete their normal service life.

H. Signs

1. Control and Authority. All existing highway signs, markers, delineators and their supports (authorized by the Department of Transportation) within the contract limits shall remain under the control and jurisdiction of the Engineer and shall be maintained for the duration of the contract by the Contractor if directed by the Engineer. Any signs not authorized by the Department of Transportation, shall be removed from the right-of-way if ordered by the Engineer.

2. Maintenance of Route Marker Signs. Route marker signs shall be maintained by the Contractor during construction. Should relocations be necessary at various stages of construction, they shall be in conformance with the M.U.T.C.D. and the directions of the Engineer to locations visible to traffic. Appropriate directional signing shall also be used in conjunction with route marker signs.

3. Storage of Existing Signs, Markers and Delineators. The Contractor, when ordered, shall remove existing signs, markers and delineators and their supports which interfere with the construction operations; store, protect, clean and replace them on the contract as directed to

locations approved by the Engineer. Signs, markers and delineators not to be replaced, shall be cleaned and delivered to the Engineer as directed. Signs, markers and delineators lost or damaged because of negligence on the part of the Contractor, shall be replaced at the Contractor's expense.

TABLE 619-1 REQUIRED TREATMENT FOR PAVEMENT EDGE DROP-OFFS

Depth of Drop-off (mm.)	Anticipated Exposure Time (Calendar Days)	AADT ≤ 7500		AADT ≥ 7500 and all Freeways and Expressways	
		Operating Speed ≤70 km/h	Operating Speed > 70 km/h	Operating Speed ≤ 70 km/h	Operating Speed >70 km/h
50 to 150	≤7	30	45	15	15
	8 to 60	30 / 1:1	60/ 1:1	15 / 1:1	30 / 1:1
	60+	30 / 1:1	60 / 1:1	15 / 1:3	60/ 1:3
150 to 600	≤7	15	15	15	15
	8 to 60	15	60 / 1:3	30 / 1:3	60 / 1:3
	60+	15	60 / 1:3	30 / 1:3	60 / 1:3
600+	≤7	15	15	15	15
	8 to 60	30 / 1:3	60 / 1:3	30 / 1:3	60 / 1:3
	60+	30 / 1:3	60 / 1:3	30 / 1:3	Positive Barrier

DEVICE SPACING / RAMP SLOPE
METERS / VERT. :HORIZ.

Notes

1. The table shows spacing for drums or Type III barricades. The spacing shall be halved if other channelizing devices are used. Type III barricades may be used instead of drums, if space permits, but no separate payment will be made unless otherwise shown on the plans
2. For drop-off lengths shorter than the maximum devices spacing shown in Table 619-1, or for drop-offs at intersections, the device spacing shall be shortened to provide adequate channelizing as directed by the Engineer.
3. Two flashing warning lights shall be used at the beginning of each work zone drop-off.
4. The ramp from the pavement surface to the excavated area shall not exceed the slope shown in the Table. Cases where no slope is shown, no sloped ramp is required.
5. Whenever it is not practicable in the opinion of the Engineer to achieve the desired ramp slope shown in the Table, the flattest practicable ramp shall be constructed and the device spacing shall match the 7 day spacing, except positive barrier shall be required for drop-offs exceeding 600 mm on roadways with traffic volumes exceeding 7500 vehicles per day.
6. At the Contractor's option, required 1:3 ramps may be flattened to 1:4 and device spacing increased to 60 meters.
7. For drop-offs located more than 3 meters from the edge of the travel lane, ramping shall not be required and the minimum required spacing for drums and Type III barricades shall be 30 meters. (15 meters for alternate devices). Drums or Type III Barricades spaced at 15 meters or other approved devices spaced at 15 meters may be substituted for positive barrier. Signs and flashing warning lights shall be provided as required in this Section for drop-offs greater than 150 mm.
8. For winter shutdown periods, the Contractor shall restore the roadway to the normal operating

condition whenever possible. If this cannot be achieved, a compacted 1:4 ramp shall be provided at all pavement edge drop-offs. If a 1:4 ramp cannot be provided, a positive barrier shall be required, unless otherwise directed by the Regional Construction Engineer, at no additional cost to the State.

9. For drop-offs exceeding 600 mm in depth for exposure times of 7 days or less, and when an offset of at least 600 mm cannot be provided from the edge of travel lane to the drop-off, alternate traffic control plans may be required by the Engineer.

Table 619-2 TAPER RATES FOR POSITIVE BARRIER

OPERATING SPEED (km/h)	50	65	80	90	100	110
TAPER RATE FOR TEMPORARY CONCRETE BARRIER	8:1	11:1	14:1	16:1	18:1	20:1
TAPER RATE FOR BOX BEAM OR HEAVY POST CORRUGATED BEAM	7:1	9:1	11:1	12:1	13:1	15:1

I. Existing Pavement Markings. The Contractor shall remove, as soon as practicable, existing pavement markings where indicated on the plans, in the proposal or where ordered by the Engineer. This shall include any pavement markings that are added during the course of the work. If darkness or inclement weather interferes with removal operations, such operations should be accomplished during the next daylight period or as soon thereafter as weather conditions permit.

The method of removal is subject to the approval of the Engineer. Obliterated markings shall be unidentifiable as pavement markings under day or night, wet or dry conditions. Overlaying existing stripes with black paint or asphalt does not meet the requirements of covering, removal or obliteration; however, the use of removable, nonreflective, preformed tape is permitted where markings need to be covered temporarily. Grinding, sandblasting, etc., must be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect the motorist.

J. Exposed Guide Railing, Median Barrier, and Bridge Railing Ends. During non-work hours, when traffic is being maintained on the facility, all exposed approach ends (free ends) of guide railing, median barrier, and bridge railing shall be marked with a reflectorized drum and temporarily terminated. Corrugated beam guide railing and median barrier, and heavy post blocked out corrugated beam guide railing and median barrier shall be temporarily terminated by having the exposed approach ends (free ends) dropped to the ground and pinned in a manner approved by the Engineer. The approach ends of box beam guide railing, median barrier and bridge railing shall be temporarily terminated with box beam guide railing end assemblies utilizing two splice plates and the proper number of bolts per connection. No posts for anchorages will be required. Special temporary splice plates will be needed to adapt box beam guide railing end assemblies to box beam median barriers.

619-3.02 Construction Signs, Reflectorized Signs, and Sign Covers. The Contractor shall furnish and erect appropriate construction signs to adequately and safely inform and direct the motorist and to satisfy legal requirements. All signs shall indicate actual conditions, and shall be removed and/or relocated, or changed immediately as required in the contract documents and as directed by the Engineer.

All signs shall be the property of the Contractor and shall be maintained in good condition for the duration of the contract. All signs shall be removed from the work site when the contract is accepted.

Sign sizes and details shall conform to the standard sheets, MUTCD, and the contract documents. The number of signs indicated on the standard sheets, in the MUTCD, and in the contract documents are a minimum number and the contractor shall have an adequate quantity of these signs available for immediate use, as required. The Engineer may order that additional signs be used.

All wood supports, and backs of plywood sign panels shall be painted with two coats of white paint.

All signs shall be kept clean, mounted at the required height on adequate supports, and placed in the

proper position and alignment so as to give maximum visibility. In general, sign orientation shall conform to the MUTCD, Section 201.5, subdivision (g). All sign supports shall display the sign panel in as vertical an orientation as possible. The deviation angle from vertical shall not exceed ±5 degrees.

Signs that are erected and removed or relocated on a daily basis, or that must be frequently relocated to adjust to the location of construction operations, may be mounted on portable sign supports. Signs that are to remain at a fixed location may be supported on posts mounted in the ground. The type of sign supports used shall be selected by the contractor, subject to the approval of the Engineer. If rigid diagonal bracing is used, the high end of the bracing shall face away from approaching traffic. All supports, except those located beyond the deflection distances of guiderail or temporary barrier, or otherwise protected against impact by errant vehicles, shall meet the following safety requirements for portable and fixed supports.

A. Portable Supports. Ballast used to stabilize supports shall be bagged sand or other suitable material approved by the Engineer, and shall be located at ground level. Portable supports shall comply with one of the following:

1. Manufactured portable supports designed for the display of signs in temporary traffic area. For manufactured supports purchased after October 1, 2000, the Contractor shall obtain from the supplier, and provide to the Engineer upon request, a certification that the support meets the requirements of NCHRP 350 Test Level 2 or Test Level 3. The use of devices certified as meeting Test Level 2 shall be limited to roadways with a posted speed limit of 40 mph or less. Test Level 3 devices may be used on all roadways.

2. Wood supports of a configuration which has been satisfactorily crash tested as indicated in # 1 above.

3. Metal supports fabricated in accordance with the details shown on the standard sheet entitled "Type III Construction Barricades".

Fabricated wood or metal supports shall not be placed on their sides unless they are placed behind a barrier or removed a safe distance from the roadway, as determined by the Engineer.

B. Fixed Supports. If stakes are used to attach the lower end of diagonal braces to the ground, they shall not protrude more than 100 mm above the ground surface. Fixed supports shall comply with one of the following:

1. Type A Sign Supports meeting the requirements of §730-24 and the applicable Materials Details may be used for sign sizes appropriate for those supports.

2. Sign posts and footings meeting the requirements of §730-20 and the applicable Standard Sheets may be used for sign sizes appropriate for those supports.

3. Wood posts, excluding any synthetic or composite wood product, may be used as follows:

a. Wood posts up to 89 mm by 89 mm with no holes drilled.

b. Wood posts up to 89 mm by 140 mm having 2 holes of 38 mm diameter, drilled in the direction perpendicular to the flow of traffic and located 100 mm and 450 mm above ground level. These holes shall be filled with flexible caulking.

No more than two posts of acceptable sizes as listed above shall be located within a single 2.1 meter width, and no more than one post of acceptable size as listed below shall be located within a single 2.1 meter width.

c. Wood posts up to 89 mm by 140 mm with no holes drilled.

d. Wood posts up to 140 mm by 184 mm having 2 holes of 75 mm diameter, drilled in the direction perpendicular to the flow of traffic and located 100 mm and 450 mm above

ground level. These holes shall be filled with flexible caulking.

Wood posts larger than 140 mm by 184 mm shall not be used.

4. Any other support that the Contractor may select, upon submission of documentation to the Engineer demonstrating that the post selected meets the current AASHTO and NCHRP criteria for impact performance of Highway Sign Supports.

Supports for construction signs shielded by barrier or guiderail, and located beyond the deflection distance described below, do not have to conform to the above safety requirements.

TABLE 619-3 GUIDERAIL & CONCRETE BARRIER DEFLECTION DISTANCES

Guide Rail Type	Post Spacing	Deflection Distances
Cable	4880 mm	3350 mm
	3660 mm	2900 mm
	2440 mm	2440 mm
	1220 mm	2130 mm
Corrugated Beam (Weak Post)	3810 mm	2440 mm
	1900 mm	1830 mm
	1270 mm	1520 mm
Corrugated Beam (Heavy Post)	1900 mm	1220 mm
	950 mm	610 mm
Box Beam	1830 mm	1520 mm
	910 mm	1220 mm
Concrete Barrier	NOT APPLICABLE	0 mm

Flexible signs will only be allowed for short-term, daytime use, for portable type signs that are deployed for use on a daily basis. They may not be used overnight, or for signs mounted on supports installed in the ground, or on portable supports that are left in place continuously for more than one work day. All flexible sign panels shall be mounted on supports with adequate bracing, so as to minimize flutter and to support the intended shape of the sign.

Intermixing reflective fluorescent orange colored signs with non-fluorescent orange colored flexible signs within the same series of signs shall not be allowed.

All construction signs shall be mounted in accordance with the MUTCD. Signs on rigid panels, except rigid lightweight plastic sign panels, shall be mounted at a minimum height of 1.5 m. Flexible sign panels, including rigid lightweight plastic sign panels, shall be mounted at a minimum height of 1.5 m, or optionally as low as 0.3 m when the following conditions are met:

A. On two lane, two-way roadways and four lane divided highways, when signs are placed on the left and the right sides of the roadway.

B. Where there will be no parked vehicles to obstruct the view.

C. When at least one advance work zone warning sign, mounted at a height of 1.5 m is located upstream of any flexible signs to alert motorists that they are entering a construction zone.
D. When the Engineer determines that the lower mounting height does not adversely affect the motorists' visibility of the sign.

If signs are temporarily covered, the cover shall be attached in a manner that completely covers the face of the sign. No adhesive shall be applied to the face of the sign, and the method of attaching the cover shall not damage the sign face. Sign covers shall be secured firmly to prevent dislodging and shall be maintained in good condition to present a neat appearance and minimize distraction to motorists traveling through the work zone. Sign covers shall contain no wording or images. Damaged covers which are determined by the Engineer to be no longer effective shall be replaced.

On limited access highways, when the normal legal speed limit is 50 MPH and higher, the Contractor shall have available at the project site, sufficient warning signs as described below, to inform oncoming traffic of a stopped, or very slow traffic condition. These signs shall be placed, moved, covered, maintained and removed in a manner directed by the Engineer.

The sign shall measure 1.2 m x 1.2 m, and letters shall be 175 mm Series D, similar to a W8-10, except it shall read "BE PREPARED TO STOP." The background color shall be fluorescent orange (Materials Designation 730-05.04, Class D). Each sign shall be mounted on a suitable portable support, and each shall be equipped with a pair of warning flags conforming to the requirements of the MUTCD, Section 294.2. Both sides of the approach shall be signed unless the median is too narrow, or if there are fewer than three lanes in the approach.

The sign shall be posted approximately 460 m upstream of the end of the queue, and when the end of the queue moves, the sign shall also be moved to maintain that spacing. If the resulting location places the sign upstream of the first warning sign for the project, the contractor shall also furnish and place an appropriate general work zone sign. The work zone sign shall be placed approximately 300 m in advance of the "BE PREPARED TO STOP" sign.

Whenever a reduced regulatory speed limit for a highway work area has been legally established by any means, the R-2 speed limit signs and, if used, the R2-10 speed zone ahead signs for the reduced speed shall be supplemented by a work zone warning panel as described below.

The work zone warning panels shall be the same width as the speed limit sign they are supplementing. They shall be 150 mm high with 75 mm Series B lettering when used with size B speed limit signs; 200 mm high with 100 mm Series B lettering when used with size C speed limit signs; 300 mm high with 150 mm Series B lettering when used with size D speed limit signs and 400 mm high with 200 mm Series B lettering when used with size E speed limit signs. The panel shall read "WORK ZONE" with black legend and fluorescent orange background (Materials Designation 730-05.04, Class D). These panels shall be placed on the same posts and immediately above the speed limit signs.

Signing advising motorists of increased fines for speeding within a highway work area shall be installed on the mainline in advance of any highway construction or maintenance work area where the work encroaches on a travel lane. It shall also be installed where work encroaches on the shoulder for more than one day unless otherwise indicated by the Engineer. The signing shall conform to one of the following methods as shown on the plans or directed by the Engineer:

The "FINES DOUBLED FOR SPEEDING IN WORK ZONES" sign shall be installed upstream of the first advance warning sign. It shall not be placed between a warning sign and the condition to which it relates, or within a warning sign countdown series. To avoid the aforementioned conditions, install the sign approximately 300 m upstream of the first warning sign on highways with 85th percentile speeds equal to or greater than 70 km/h (45 mph) and 100-150 m upstream for speeds under 70 km/h (45 mph.) The sign shall have black legend and border on a white background (Materials Designation 730-05.01, Class A) except for the top of the sign which has black background and white "STATE LAW" legend. If not otherwise detailed in the plans, the sign shall be a minimum of 600 mm wide by 900 mm high with "STATE LAW" in 75 mm Series D white lettering on a black background and "FINES DOUBLED FOR SPEEDING IN WORK ZONES" in 75 mm Series C black lettering. Unless otherwise indicated in the plans, a double sized sign shall be used in freeway and multilane applications where the 85th percentile

speed equals or exceeds 55 mph.

If indicated on the plans or approved by the Engineer as an alternative to the "FINES DOUBLED FOR SPEEDING IN WORK ZONES" sign, a reduced work area speed limit sign may be supplemented by an R2-13 "FINES DOUBLE" panel in addition to the "WORK ZONE"panel. The R2-13 "FINES DOUBLE" panels shall be the same width as the speed limit sign they are supplementing. They shall be 300 mm high with 75 mm Series D lettering when used with size B speed limit signs; 450 mm high with 100 mm Series D lettering when used with size C speed limit signs; 600 mm high with 150 mm Series D lettering when used with size D speed limit signs and 900 mm high with 200 mm Series D lettering when used with size E speed limit signs. The panel shall read "FINES DOUBLE" with black legend and borders and white background (Materials Designation 730-05.02, Class B). These panels shall be placed on the same posts and immediately below the speed limit signs. If the R2-13 "FINES DOUBLE" panel is added to a previously installed speed limit assembly, it may be necessary to install additional sign posts based on an assessment of the adequacy of the existing posts to support the additional panel. It may also be necessary to adjust sign mounting heights to meet the 1500 mm minimum mounting height requirement in §619-3.02 B.

Both the work zone warning and the fines double panels shall be completely covered or otherwise removed from view when the R-2 speed limit sign is covered or removed.

619-3.03 Temporary Box Beam Barrier, Temporary Concrete Barrier, Construction Barricades, and Lighting for Construction Barricades. The Contractor shall furnish, erect, move and remove, temporary concrete barrier, construction barricades and lighting for construction barricades where and as indicated on the plans, on the standard sheets, in the M.U.T.C.D., or as directed by the Engineer. Posts and painted members or bands used to delineate drop-offs will not be considered barricades. The contractor shall provide and maintain delineation on temporary barriers. This delineation shall make the barrier visible to approaching traffic as well as traffic which is adjacent to the barrier. The contractor shall have the choice of using one, or more, of the following: Warning lights, delineators, pavement marking, reflectorized tape placed on the barrier, reflective paint, or any other device subject to the approval of the Engineer. The delineation devices shall be maintained dirt and snow free and visible throughout the term of the contract including shutdown periods.

Where indicated on the plans or in the proposal, construction barricades shall be supplemented by approved flashing or steady burning lights, as indicated.

Temporary box beam barrier shall be erected in accordance with the requirements for box beam median barrier specified in §606-3.01 and §606-3.03.

Each run, or bay, of temporary concrete barrier units shall be fastened together to form a continuous chain. After placement each successive unit shall be moved longitudinally to remove the slack in the joint between units. The units at each end of a run or bay shall be anchored as shown on the standard sheet. In order to reduce movement of the barrier on structures, areas where limited deflection is desired, or where directed by the Engineer, one of the methods shown on the standard sheet shall be used. Where shown on the plans or directed by the Engineer, the ends of the barrier run shall be fitted with an impact attenuation device or fitted with a tapered end section and flared back as directed.

Steady burning or flashing barricade lights have a minimum nominal diameter of 175 mm and shall emit yellow light. Steady burning lights may be used to supplement other channelizing devices to delineate the traveled way. Flashing lights shall not be used for delineation or channelizing purposes.

Flashing barricade lights shall be either Type A, Low Intensity, or Type B, High Intensity conforming to the requirements of section 294.3 of the M.U.T.C.D. High intensity lights shall be used where barricade lights are required to operate 24 hours per day. Low intensity lights shall be used where barricade lights are required only at night. In that event, the hours for operation of the low intensity lights shall be dusk to dawn.

Steady burning lights shall have a minimum beam intensity of 2 candelas maintained within a solid angle of 9° on each side of the vertical axis, and 5° above and 5° below the horizontal axis. The hours for operation of steady burning barricade lights shall be dusk to dawn.

619-3.04 Temporary Structures and Approaches. Temporary structures and their approaches or existing structures that are moved to provide temporary structures along with their temporary approaches shall be constructed in such a manner and sequence that interference with and inconvenience to the traveling public and the abutting owners is kept to a minimum. The Contractor shall be responsible for the workmanship, upkeep and safety of all temporary structures and approaches. All fabrication shall conform to the current AASHTO Specifications for Highway Bridges, Division II except as modified herein. Fabrication shall be performed by an AISC Category III Certified Fabricator

When specific details are not indicated on the plans, the Contractor shall design all elements of the temporary structure and approaches including the railing system. Design shall be done in conformance with the A.A.S.H.T.O. standard specifications for Highway Bridges which is current on the date of advertisement for bids. Design live load shall be MS 18 unless otherwise noted on the plans. Plans and design computations shall bear the stamp and signature of a Professional Engineer licensed to practice in the State of New York.

Prior to beginning construction of any structure designed by the Contractor or the Contractor's agents the Contractor shall submit detailed plans to the D.C.E.S. for review and approval in accordance with §585-3.02. Such review, however, shall not relieve the Contractor of the responsibility for the adequacy and design of such temporary structures and approaches. If the Contractor proposes to construct with used materials, the Contractor's Engineer shall submit with the plans the method for documenting that all primary member material meets the design. In the absence of Mill Certification Reports, physical testing shall be performed. Excluded from this provision are proprietary structures. All welding required for the fabrication of temporary steel structures shall be performed in accordance with the provisions of the New York State Steel Construction Manual. Complete joint penetration groove welds in main material shall be radiographed as described therein. The DCES reserves the right to perform in-process fabrication inspection. The Contractor shall notify the DCES of the fabrication Schedule 10 days prior to commencement of work.

619-3.05 Tubular Markers. Tubular markers shall be installed according to the manufacturer's instructions on asphalt or concrete pavement that has been properly cleaned with a wire brush to remove all paints, dirt, oil or any substance which will interfere with the proper bond. Bonding agents shall be of sufficient amount or size to ensure proper bonding of the base to the pavement. When epoxy is used the epoxy shall be applied evenly to the bottom of the base of the marker and the base shall be pressed firmly on the pavement surface until a bead of epoxy appears around the edge. When installing the marker with a butyl pad, the pad shall cover the entire bottom of the base of the marker. Tubular markers not installed properly along the required line, as determined by the Engineer, shall be removed and reset.

Tubular markers damaged by the Contractor's operation or by traffic shall be replaced within 24 hours or as directed by the Engineer. The Engineer shall direct the Contractor to replace damaged reflective sheeting as required. This sheeting shall be removed and disposed of in an approved manner at the time as directed by the Engineer.

619-3.06 Short-Term Pavement Markings. The Contractor shall furnish, apply, maintain, and when so ordered, remove short-term pavement markings, where shown in the contract documents or where directed by the Engineer. Any pavement upon which traffic will be maintained shall be properly marked before nightfall or the end of the working day, whichever comes sooner, in accordance with this subsection.

Short-term pavement markings shall be installed and maintained in accordance with the patterns and colors indicated for pavement marking, Parts 260 to 263 of the M.U.T.C.D. or as directed by the Engineer. Where the limits of passing and no-passing zone have not been determined prior to construction, the Contractor shall allow the Engineer one week after the placement of binder or top course to determine these limits. If the Engineer codes these limits right on the pavement surface, this coding shall be preserved, by the Contractor, offset from the roadway.

Alternately, if the pay item 'Determination of No-Passing Zones and Pavement Coding' is included in the contract, this determination shall be made by the Contractor either on binder course or top course.

The following pavement marking patterns shall be installed as short-term pavement markings:

1. Yellow broken lines, partial barrier lines and full barrier lines used to separate opposing traffic flows on two-way roadways.
2. White broken lane lines to separate traffic flows in the same direction on multi-lane highways.

Stop bars, hatch lines and edge lines will not normally be required under short-term pavement markings but may be ordered by the Engineer. Broken lines may be as short as 1200 mm. Short-term pavement markings as described above, will be considered acceptable as the only pavement markings in place for periods normally not longer than fourteen (14) days, unless otherwise extended by the Engineer.

Within 14 days after paving, or the time period as extended by the Engineer, if the Contractor fails to install either the succeeding pavement course, or the final pavement markings on contracts with pay items for such, the short-term pavement markings shall be supplemented (at no additional expense to the State) with edge lines, 3 meter broken lines, stop bars, cross walks and arrows. In the event the project is to remain uncompleted over the winter, other than for staged construction when indicated, the short-term pavement markings shall be supplemented (at no additional expense to the State) by full pavement markings in accordance with the pattern indicated in the plans. If no full pavement marking pattern is given in the plans, the short-term pavement markings shall be supplemented as directed by the Engineer. The pavement markings used to supplement the minimum short-term pavement markings shall be designated as 'Temporary Pavement Markings' and use the materials as described below.

Removable tape and raised markers can be used as short-term pavement markings for solid and broken lines on any pavement course. However, on the final pavement surface, these shall be offset, if possible, from the location of the final mark in order to prevent interference with the adhesion of the final mark.

Pavement marking paint can be used as short-term pavement markings for solid and broken lines on all underlying pavement courses (ie base, binder, leveling and shim). On top course, or final pavement surface, paint may only be used if the final marking pattern is known prior to paving, and the contract does not contain durable markings (ie thermoplastic or epoxy marks). Where paint is used on the final pavement surface, it shall be applied before nightfall in the final location. If the Contractor is unable to place the final pavement marking paint before nightfall on contracts with pay items for Reflectorized Pavement Marking Paints (Section 640), then removable short-term pavement markings shall be installed before nightfall offset from the final location at no additional cost to the State.

Non-removable tape may be used as short-term pavement markings only for broken lines on underlying pavement courses. Non-removable tape will not be allowed to mark barrier lines on any pavement course.

If paint is used for short-term pavement markings, it shall be applied in accordance with the requirements of Section 640, Reflectorized Pavement Marking Paints. If tape is used, it shall be applied to a clean, dry pavement in accordance with the manufacturer's recommendations. Tape shall conform to the shape of, and adhere to the surface upon which it is applied. If raised marker units are used, they shall be of a color in accordance with the M.U.T.C.D. A raised marker unit spaced every 1500 mm may be used as a substitute for a solid line. Three raised marker units, evenly spaced 600 mm apart, may be used as a substitute for a 1200 mm long broken line. Four raised marker units, evenly spaced one meter apart, may be used as a substitute for a three meter long broken line.

Any markings, including raised markers, that fail to adhere to the pavement, become abraded, dislodged by snowplowing, or in the opinion of the Engineer become ineffective in any manner during the "period of use" shall be replaced by the Contractor at no additional expense to the State. The "period of use" shall be defined as the time from when the short-term pavement markings are first applied to the time when the markings are either paved over, the project's final markings are applied, or contract acceptance, whichever is first. After their period of use, short-term pavement markings, and temporary markings added to supplement short-term pavement markings shall be removed from the pavement by the Contractor, if ordered by the Engineer, as described in Section 635 Cleaning and Preparation of Pavement Surfaces.

In the event of sudden, unforeseen precipitation or other extraordinary situations, Do Not Pass signs may be used in lieu of short-term pavement markings for up to three consecutive calendar days on two or three lane, two-way, roadways under the following conditions:

1. The signs meet the requirements of Section 214.2 of the NYSDOT MUTCD and spaced not more than 300 meters apart.
2. The signs shall be supplemented with delineators and/or plastic drums spaced as directed by the Engineer, but not more than 60 meters apart and meeting the requirements of Section 291.2 of the NYSDOT MUTCD and §619-3.01G. of the Standard Specifications, respectively.
3. No payment will be made for the installation of Do Not Pass signs, delineators and plastic drums when necessitated by the Contractor's failure to place short-term pavement markings.

619-3.07 Temporary Traffic Signals. The traffic signal system shall be constructed in such a manner that interference with and inconvenience to the traveling public is kept to a minimum. The Contractor shall maintain in proper operation, all temporary signals used for Maintenance and Protection of Traffic until approved removal. The Contractor shall be responsible for their continuous 24-hour operation except for reasonable shutdown during relocation and transfer operations.

If for any reason a signal is not functioning as required, the Contractor shall commence repair work on this signal within two hours after notification of a malfunction. The Contractor shall provide a flagger at each malfunctioning traffic signal during repair work. The flagger control shall be provided until the temporary traffic signal is restored to proper operation.

On each approach, one signal face shall be at the right side of the roadway or over the right half of the roadway. One signal face shall also be installed at the left side of the roadway or over the left half of the roadway.

The lateral distance between signal faces for each approach shall be a minimum of 2400 mm and a maximum of 8230 mm.

In the event flashing operation occurs, all signal faces shall show flashing red indications. Flashing operation of signal is considered a malfunction.

In the event the Contractor elects to use temporary traffic signals to control traffic in lieu of flaggers, the Contractor shall submit complete plans of the proposed work to the Engineer for approval at least 30 days before signals are required for the maintenance of traffic. Plans shall show type of proposed equipment, details of construction, and table of operation of the temporary signal system.

619-3.08 Mailboxes. The Contractor shall not move any mailbox which contains mail. The Contractor will advise the owner to remove such mail before the box is moved. Before acceptance of the work, any mailbox which has been disturbed or removed, shall be replaced by the Contractor in a location approved by the Engineer.

In the event the original mounting post has been lost, damaged, or is unusable, the Contractor shall furnish a similar device or mounting acceptable to the Engineer, or when directed shall furnish a galvanized pipe mounting post of 25 mm (minimum) diameter with flanged top fitting and will firmly install the new mounting and mailbox at the designated location and at the proper height in accordance with the requirements of the U.S. Postal Service and to the satisfaction of the Engineer.

619-3.09 Opening Highway to Traffic Prior to Contract Acceptance. The construction details specified in §619-3.01 through §619-3.08 shall apply when required.

619-3.10 Maintain Traffic Signal Equipment. General. Existing, relocated, modified or newly installed traffic signals identified in the contract documents or by the Engineer shall be maintained in proper operation as specified in Requirement A, B or C of this subsection as called for in the contract documents.

Proper operation shall include the maintenance of all features of the traffic signal operation in effect and operating at the time any work begins on the contract as defined in §619-1.11, Duration of Contract. Traffic actuated phases shall be maintained actuated and signals operating within signal systems shall remain in step with the remainder of the system unless otherwise approved by the Engineer. Except for

emergencies, no changes in the signal operation or timing shall be made without prior approval by the Engineer. If emergency conditions dictate a change in the operation, the Engineer shall be notified accordingly by the start of the next work day. Unless otherwise approved by the Engineer, an altered signal operation must be returned to the original signal operation within 24 hours.

The Contractor shall maintain in operation all equipment including signal heads, supports, cable, wiring, existing and new span wire mounted signing, controllers, master controllers, detector systems, conflict and current monitors, relays, switch packs, and all other accessory and necessary equipment. Maintenance shall also include the repair and replacement of existing detector loops, under separate items. All parts, supplies, equipment and labor shall be furnished by the Contractor.

The Contractor shall have capable traffic signal repair personnel on call 24 hours a day ,seven days a week, and shall provide to the Engineer a single telephone number for contacting them. If for any reason, a signal is not functioning properly, the Contractor shall commence work on the signal within two hours notification. If directed by the Engineer, the Contractor shall notify the appropriate police agency for traffic control operations. If the police agency cannot or will not provide traffic control, the Contractor shall provide flaggers at locations specified by the Engineer within the two hour time period. The Contractor shall continue the flagger services until the signal is in proper operation. Reflectorized "Flagger Ahead" signs shall be used in conformance with the M.U.T.C.D. on all approaches to an intersection controlled by flaggers.

The Contractor shall, on a daily basis, provide the Engineer with a record of all maintenance calls received and responded to, as well as a record of all corrective action taken by the Contractor.

Where the Contractor is required to temporarily relocate existing traffic signals because of his construction operations, all existing equipment, fittings, wire, cable, conduit, and related materials shall be reinstalled and extended where necessary. Temporary timber poles (Class 2), guys and related material shall be furnished and installed where necessary. Temporary timber poles shall be treated with an appropriate wood preservative in accordance with the American Wood Preserver's Association Standard C2. Preservative retentions shall be appropriate for the specie when used in ground contact application.

Requirement A. The contractor shall maintain in proper operation, for the duration of the contract, the indicated existing, relocated, modified and newly installed signals as required by the contract documents. If such signals are to be removed, the Contractor shall be responsible for the operation and maintenance of them until their approved removal. The Contractor shall be responsible for their continuous operation except for reasonable shutdown periods authorized by the Engineer during relocation and transfer operations. All of the requirements in the "General" subsection of this specification shall apply.

Requirement B. All requirements of the "General" subsection shall apply except that the State shall assume operation and maintenance responsibility for the signal from the Contractor following successful completion by the Contractor of the installation/modification testing as required by §680-3.32, Tests. Assumption of operation and maintenance responsibility by the State shall not relieve the Contractor of the responsibility under §104-08, Warranties and Guarantees, for the correction of defects in material or labor provided by the Contractor. However, the six month period shall be measured from the day the State assumes maintenance responsibility. The Contractor is specifically notified that State assumption of maintenance responsibility shall not relieve the Contractor of any responsibilities under §107-09, Damage.

Requirement C. All the requirements of the "General" subsection shall apply except that at relocated, modified or newly installed signals, the State will assume responsibility for the following four items after successful testing as required by §680-3.32, Tests, has been completed. At existing microcomputer traffic signals, the State shall be responsible for those four items for the duration of the contract.

1. Supply and maintenance of the microcomputer assembly and software.
2. Programming of the microcomputer furnished by the State.

3. Operation or timing changes directed by the Engineer.
4. Normal (no abuse, or vandalism) equipment failures of existing, relocated, modified or new traffic signal equipment furnished by the State.

All other operational features and signal equipment shall be maintained by the Contractor in accordance with the "General" provisions of this subsection for the duration of the contract. Prior to the assumption by the State of maintenance responsibility for relocated, modified or newly installed signals, the Contractor shall maintain such signals under the "General" provisions of this specification. It shall be the Contractor's responsibility to investigate all maintenance calls as outlined in the "General" provisions. If the malfunction is in the equipment supplied by the State, the Contractor shall notify Regional Traffic and Safety personnel and, if directed by the Engineer, provide flaggers until the arrival of State maintenance personnel. Such flagging operations in excess of four hours per maintenance call shall be paid for as extra work.

Assumption of the above listed responsibilities by the State shall not relieve the Contractor of the responsibility for operation and maintenance of the signal as required by this section. Further, the Contractor will not be relieved of any responsibility required under §104-08, Warranties and Guarantees, for the correction of defects in material or workmanship provided by the Contractor. The Contractor shall also be aware that State assumption of the above responsibilities shall not relieve the Contractor of responsibilities under §107-09, Damage.

619-3.11 Flashing Arrow Boards. The Contractor shall provide Flashing Arrow Boards on multilane highways with preconstruction posted speed limits of 45 mph and higher whenever a lane is closed to traffic and vehicles are required to merge with traffic in adjacent lanes. One Flashing Arrow Board is required for each lane closed to traffic, regardless of the duration. Flashing Arrow Boards shall also be provided at locations where posted speeds are below 45 mph when shown on the plans or when indicated in the proposal.

Flashing Arrow Boards will not be required where they would interfere with the operation of a 3 color signal or flasher or where there is an operation controlled by a signal or flagger. Flashing Arrow Boards will not be required for alignment changes or lane diversions where the number of through traffic lanes is not reduced unless specifically indicated on the plans.

Flashing Arrow Boards shall be placed in accordance with the Manual of Uniform Traffic Control Devices. They shall be used as a substitute for the W1-11B; W1-11C; W1-12B; or W1-12C large arrow sign located nearest the beginning of the taper. The arrow boards shall be mounted so that the base of the panel is at least 2.1 m above the pavement surface and properly aligned to provide optimum viewing by approaching motorists. Flashing Arrow Boards may be relocated or reoriented on a daily basis or more frequently as ordered by the Engineer.

Where the posted preconstruction speed limit on the highway is 45 mph or greater within 2.0 km upstream of the board, only diesel or line powered arrow boards shall be used, unless indicated or directed otherwise. Where the posted preconstruction speed limit is below 45 mph for at least 2.0 km upstream of the taper, diesel powered, line powered or solar charged boards shall be used as approved or as directed by the Engineer.

The Contractor shall be responsible for maintenance, repair and continuous operation of the Flashing Arrow Board until progress of work no longer requires its use, as directed by the Engineer.

619-3.12 Construction Zone Pavement Markings. All pavement markings and patterns shall be placed as shown on the plans, or directed by the Engineer, and in accordance with the MUTCD.

Except when other spacings are permitted by the plans or proposal, raised reflectorized pavement markings shall be spaced as required in this paragraph. When raised reflectorized pavement markers are used to simulate a solid line, they shall be spaced 1500 mm apart; and when these markers are used to simulate a 3 m broken line, 4 equally spaced markers shall be used, with a marker at beginning and end of each line segment. Other line patterns shall be as specified in the MUTCD. When used to supplement a solid or broken line, markers shall be spaced a maximum of 24 m on tangents and a maximum of 12 m for curves with a radius less than 860 m.

The application of pavement markings on roadways open to traffic shall be done in the direction of traffic.

When required by the Engineer, the Contractor shall establish marking line points at 9 m intervals as necessary to control the lateral position of the line.

A. Application. All pavement marking materials shall be installed in accordance with the manufacturer's instructions. In addition, pavement marking paints shall be installed according to the provisions of §640-3.

B. Maintenance of Pavement Markings. The Contractor shall be responsible for maintaining the construction zone pavement markings for the duration of the temporary traffic pattern or detour. Any marking material that fails to provide for any reason, both satisfactory daytime and nighttime delineation, in the opinion of the Engineer, shall be replaced immediately by the Contractor at no additional cost to the State. Replacement shall, as a minimum, be required for the following degrees of material loss:

1. Removable Tape. Any gap exceeding 15 m in length in a solid line, or loss of shorter segments exceeding 10 percent of the total length in any 250 m segment of solid line, or more than two consecutive segments of broken line.

2. Raised Markers. Loss of more than 2 markers used to simulate a 3 m broken line; loss of more than 3 consecutive markers used to simulate a solid line, or more than 5 percent of the markers within a 250 m segment of solid line; when used to supplement a line, loss of 2 or more consecutive markers or more than 5 percent of the markers within a 1000 m segment of solid or broken line.

3. Traffic Paint. Abrasion of the line such that more than 10 percent of the underlying pavement is visible within any segment of broken line or within any 100 m section of solid line; failure of any line to be clearly visible at night under low-beam headlamp illumination when viewed from a distance of 60 m.

If the Contractor elects to use raised pavement markers as the marking material under the optional construction zone pavement markings items, the Contractor shall be responsible for maintaining these markings in acceptable condition during winter months, including loss of markers by snow plows. The Contractor shall either replace lost markers between storms, or place an alternate marking material as allowed by this specification to maintain all markings in acceptable condition, subject to the approval of the Engineer. No additional payment shall be provided for such replacement of lost markers.

The Contractor shall not be responsible for snowplow damage or loss of raised markers provided under pay items requiring the use of these markers. In the event that such markers are damaged or lost, the Engineer shall decide whether to replace the lost markers in kind or with other marking materials at the time the loss occurs. Payment shall be provided under the appropriate item for any markers replaced, or for alternate marking materials installed.

C. Removal of Pavement Markings. Construction zone pavement markings used to delineate temporary traffic patterns shall be removed at the completion of that phase of the work and prior to the installation of the next temporary pattern, or return to the permanent pattern.

Traffic paint shall be removed by mechanical means subject to their ability to achieve satisfactory results. After removal, there shall be no paint residue or pavement scarring that conflicts with successive pavement markings under any viewing conditions - wet or dry, day or night.

Marking tapes and raised markers shall be removed, intact or in large pieces, using manual methods or a mechanical roll-up device. The use of heat, solvents or other chemicals, grinders, or blasters will not be allowed on top-course pavement that is to remain in place without overlaying, or on other pavement surfaces where subsequent temporary traffic patterns are to be placed. After

removal, there shall be no resultant damage to or permanent marks or scars on the pavement surface.

Temporary adhesive residues that will eventually be worn from the pavement will be allowed to remain, providing that they are not left in a pattern that will mislead or misdirect motorists. The Engineer will be the sole determiner of misleading temporary marks.

The removal of construction zone pavement markings shall not be required from detours or other areas directed by the Engineer where they do not conflict with permanent markings at the completion of the work. Removal shall be required where it is necessary to transition pavement marking patterns on the detour into permanent markings at the completion of the detour phase.

D. Damage to Pavement Surfaces. Any damage to the finished pavement surface, any permanent marks or scars on the finished pavement surface (including remaining pavement marking material), or any adhesive residues left in a pattern that may mislead or misdirect traffic, that results from the removal of pavement markings shall be removed or repaired as directed by and to the satisfaction of the Engineer at no expense to the State, including complete removal and/or replacement of the damaged pavement section if necessary. The Engineer shall be the sole determiner of satisfactory repair.

619-3.13 Maintenance and Protection of Traffic During Nighttime Operations. In addition to the requirements of basic maintenance and protection of traffic, additional requirements for maintenance and protection of traffic during nighttime operations shall be as follows:

A. Worker Protection. All workers involved in nighttime operations shall, at all times, wear reflective hard hats and vests or high visibility apparel as described below:

1. Hard hats shall be equipped with a minimum of 7600 mm² of reflective tape on all four sides (i.e. 1900 mm² per side).

2. Vests and high visibility apparel shall be orange, yellow, or strong yellow-green in color or fluorescent versions of these colors (flaggers shall wear orange) and shall include retroreflective material, white or silver in color, visible for a minimum of 300 m in all directions under headlight illumination.

3. Retroreflective clothing shall be designed to clearly identify the wearer as a person and shall be visible through a full range of body motions.

4. Retroreflective clothing and vests shall be closed front and rear. Open front vests shall not be permitted.

5. All retroreflective clothing and vests shall be in clean condition or replaced as necessary to maintain visibility and reflectivity.

These requirements apply to truck drivers and equipment operators when out of an enclosed cab.

B. Vehicle Protection. All vehicles and equipment in the traffic control zone shall be equipped with rotating amber beacons which shall be visible from all directions for a minimum of 300 m during daylight. Beacons shall be mounted in a manner which does not cause glare for the driver or operator.

Vehicles operating or parked on the pavement of a closed roadway or travel lane shall display 4-way flashers or beacons at all times.

Rollers shall display a 50 mm band of reflective tape on the front and rear (60 000 mm² per end minimum).

All trucks shall display a minimum of 60 000 mm² of reflective tape on the rear.

Haul trucks shall display a 600 mm by 1200 mm orange reflective sign with the legend "Construction Vehicle - Do Not Follow" in black lettering on the tailgate.

All construction equipment when moving at a speed below the operating speed of traffic in an open travel lane or on a shoulder adjacent to an open travel lane shall be equipped with an amber rotating beacon and shall be followed by a chase vehicle equipped with an amber rotating beacon

and 4-way flashers.

Vehicles (except for rollers) shall travel facing in the same direction as adjacent traffic in order to avoid glare and confusion to drivers.

C. Signs, Delineation and Guiding Devices. All signs, delineators and guiding devices for nighttime operations shall be kept clean and visible with good reflectivity.

Type III construction barricades shall be used whenever an entire roadway or ramp is closed to traffic.

Plastic drums or 300 mm by 600 mm vertical panels shall be used for channelizing and delineating lane closures. Oversize (900 mm) cones may be used on tangent runs beyond the completion of the lane closure tapers. Spacing shall be in accordance with the following:

Estimated Operating Speed (km/h)	Maximum Spacing (m)
30	6.0
50	9.0
≥70	12.0

Delineation at gores or intersections shall be spaced at intervals equal to one-half of the above table values and shall consist of plastic drums or 300 mm by 600 mm vertical panels except that every other device may be an oversize (900 mm) cone at the Contractor's option.

When traffic will be traveling adjacent to closed travel lanes; two plastic drums, two 300 mm by 600 mm vertical panels or two oversize (900 mm) cones shall be placed transversely in each closed lane at 225 m maximum intervals (unless a lesser spacing is shown on the plans) except where it would interfere with paving, rolling or other ongoing operations. A Type III construction barricade may be substituted at the Contractor's option. No additional payment for Type III construction barricades will be made when used for this purpose.

619-4 METHOD OF MEASUREMENT

619-4.01 Basic Maintenance and Protection of Traffic. Payment for Basic Maintenance and Protection of Traffic will be made on a lump sum basis.

619-4.02 Construction Signs. Payment for signs will be made on a lump sum basis.

619-4.03 Temporary Box Beam Barrier, and Temporary Concrete Barriers. The quantity of temporary box beam barrier, and temporary concrete barrier shall be computed by the number of meters, measured to the nearest meter, placed in accordance with the contract documents and/or direction of the Engineer. Temporary box beam barrier shall be measured in accordance with the requirements of §606-4.01. Temporary concrete barrier shall be measured along the centerline of the uppermost surface. Temporary concrete barrier installed at the option of the Contractor, or required solely by a delay in the Contractor's operations, shall not be included in the measurement or payment for temporary concrete barrier.

619-4.04 Construction Barricades. Barricades will be computed for payment by the number of meters measured to the one tenth, along the face of each barricade unit installed. No payment will be made for spaces between individual barricade units. Type III Construction Barricades used at the option of the Contractor in lieu of drums or other channelizing devices shall not be included in the measurement or payment for Type III Construction Barricades.

Whenever barricades are moved to a new location or the diagonal stripes are changed to allow traffic to pass on the other side of the barricade, measurement will be made in the same manner as if it were a new barricade. Minor movements of the barricade from one side of the roadway to the other side, daily replacement to the same location or rearrangement within a work area, not requiring any change in the diagonal stripes, will not be considered as movement to a new location and will not be measured as additional barricades

619-4.05 Lighting for Construction Barricades. Lighting for construction barricades (powered from electrical power line or self-powered flashers) will be computed for payment by the number of meters of barricade actually lighted. Measurement shall be made to the nearest one-tenth meter along the face of each barricade unit. No payment will be made for spaces between individual barricade units. No separate measurement will be made for the two flashing warning lights used at the beginning of each work zone drop-off, as required by these specifications.

619-4.06 Temporary Structures and Approaches. Temporary structures and their respective approaches will be computed for payment on a unit price basis for each structure including its approaches.

619-4.07 Flashing Arrow Board. When this work is specified to be measured as lump sum, it shall be measured on a lump sum basis, for the Flashing Arrow Boards of the required type satisfactorily furnished, installed, maintained, and removed in accordance with these specifications.

619-4.08 Short Term Pavement Markings. Short Term Pavement Markings will be measured in meters along the center line of the pavement stripe and shall be based on a 100 mm wide stripe. Measurement for striping with a plan width greater or less than the basic 100 mm, as shown on the plans or as directed by the Engineer, will be made by the following method:

$$\frac{\textit{Plan Width of Striping (millimeters)} \times \textit{Number of Meters}}{\textit{100 millimeters}}$$

No payment will be made for the length of skips in the dashed line.

If raised marker units are used, reimbursement will be made as if the substituted line were in place. For example, for three raised marker units substituted for a 1200 mm long broken line, reimbursement will be made for 1.2 meters.

619-4.09 Temporary Traffic Signals. Payment for Temporary Traffic Signals will be made on a lump sum basis.

619-4.10 Mailboxes. Mailboxes will be computed for payment on the basis of each mailbox moved or replaced. Where multiple mailboxes are installed on a single post, payment shall be based upon the number of mailboxes so installed.

619-4.11 Opening Highway to Traffic Prior to Contract Acceptance. The additional basic maintenance and protection of traffic required for the highway opened to traffic in accordance with §619-1.09 will be computed by the lane kilometers, measured to the nearest tenth, per calendar day. The lane-kilometer per calendar days to be paid for shall not include the length of temporary connections, length of ramps, or any pavement opened for the convenience of or at the request of the Contractor.

619-4.12 Maintain Traffic Signal Equipment. Maintenance of existing and new traffic signal equipment will be computed for payment on a monthly basis for each signalized intersection being maintained. Payment will be made to the nearest 1/4 month increment.

619-4.13 Tubular Markers. This work shall be measured as the number of tubular markers furnished and installed to the satisfaction of the Engineer.

619-4.14 Construction Zone Pavement Markings. Pavement striping will be measured by meter along the centerline of the pavement stripe, and will be based on a 100 mm wide stripe. When raised pavement markers are used to simulate or to supplement a pavement marking, they shall be measured as the number of linear meters of simulated or supplemented pavement stripe (e.g. a 3 meter longitudinal line segment is simulated by four, or more, individual marker units; the pavement striping will be measured as 3 meters, regardless of the number of markers installed). Measurement for striping with a plan width greater than the basic 100 mm as shown on the plans or as directed by the Engineer, will be made by the following method:

Plan Width of Striping (millimeters) x Number of Meters
100 (millimeters)

No measurement will be made for the number of meters of gaps between broken and dotted line segments. All payments for longitudinal lines shall be made on the basis of the theoretical required plan quantity.

Letters and symbols will be measured by each unit applied. A unit will consist of one letter or one symbol. Example: "SCHOOL" would be measured as six units. Double and triple headed arrows will be measured as a single unit, each "R" in a railroad grade crossing marking will be measured as a single unit, but the "X" in railroad grade crossing markings (MUTCD figure 263-33) will be measured by the number of meters of 100 mm stripe.

When raised pavement markers are used to supplement a pavement marking stripe, the supplemental raised pavement markers will be measured and paid separately from the appropriate pavement marking stripe.

619-5 BASIS OF PAYMENT

No payment will be made under Basic Maintenance and Protection of Traffic for each calendar day during which there are substantial deficiencies in compliance with the specification requirements of any subsection of this section, as determined by the Engineer, including but not limited to Basic Maintenance and Protection of Traffic, Construction Signs, Construction Barricades, Barriers, Temporary Impact Attenuators, Impact Attenuators, Crash Cushions, Crash Terminals, Lighting for Construction Barricades, Temporary Structures and Approaches, Short-Term Pavement Marking, Construction Zone Pavement Markings, Temporary Traffic Signals, Mailboxes, Maintain Traffic Signal Equipment and Opening Highway to Traffic Prior to Contract Acceptance.

The amount of such calendar day non-payment will be determined by dividing the lump sum amount bid for Basic Maintenance and Protection of Traffic by the number of calendar days between the date the Contractor commences work and the date of completion as designated in the proposal, without regard to any extension of time.

In addition, liquidated damages will be assessed at the rate shown in Table 108-1 of §108-03 for each subsequent calendar day or part thereof that a cited deficiency resulting in non-payment, as prescribed herein, is not corrected or is permitted to recur.

If the Contractor fails to adequately conform to the provisions required under Construction Signs, Barriers, Temporary Impact Attenuators, Impact Attenuators, Crash Cushions, Crash Terminals, Construction Barricades, Lighting for Construction Barricades, Temporary Structures and Approaches, Short-Term Pavement Marking, Construction Zone Pavement Markings, Temporary Traffic Signals, Mailboxes, Maintain Traffic Signal Equipment and Opening Highway to Traffic Prior to Contract Acceptance, to the degree that such failure is deemed by the Engineer to adversely affect the maintenance and protection of traffic, the above liquidated damages will be assessed in addition to any payment deductions from Basic Maintenance and Protection of Traffic for inadequate work as specified herein. The assessment of liquidated damages will not exceed the above amount per calendar day regardless of the number of violations.

If the Contractor fails to maintain and protect traffic adequately and safely for a period of 24 hours, the Engineer shall correct the adverse conditions by any means deemed appropriate, and shall deduct the cost of the corrective work from any monies due the Contractor. The cost of this work shall be in addition to the liquidated damages and non-payment for Basic Maintenance and Protection of Traffic listed above.

However, where major nonconformance with the requirements of this specification is noted by the Engineer, and prompt Contractor compliance is deemed not to be obtainable, all contract work may be stopped by direct order of the Engineer, regardless of whether corrections are made by the Engineer as stated in the paragraph above.

619-5.01 Basic Maintenance and Protection of Traffic. The lump sum price bid for Basic Maintenance and Protection of Traffic shall include all equipment, materials and labor necessary to adequately and safely maintain and protect traffic, except as provided for in separate payment items in the proposal. However, if the Contractor elects to utilize temporary traffic signals to control traffic in lieu of flaggers, the cost of such signals together with all costs of installation, operation and removal shall be included in the price bid for Basic Maintenance and Protection of Traffic.

The cost of temporarily terminating guide railing, median barrier, or bridge rail during non-work hours shall be included in the lump sum price bid for this item.

In the event the proposal does not include a separate item of payment for Opening Highway to Traffic Prior to Contract Acceptance and the Regional Director directs, in writing, any portion of pavement, structure or ramp to be opened to traffic prior to contract acceptance and on which traffic was not specified to be maintained and protected during construction, the price bid for Basic Maintenance and Protection of Traffic shall include any and all costs for opening said portion or portions to traffic prior to contract acceptance.

In the event the contract completion date is extended, no additional payment will be made for Basic Maintenance and Protection of Traffic.

Progress payments will be made for this item in proportion to the total amount of contract work completed less any deductions for unsatisfactory maintenance and protection of traffic.

619-5.02 Construction Signs. The lump sum price bid shall include the cost of labor, equipment and material, necessary to erect, remove, relocate, protect, maintain, store or replace any construction signs required to properly sign the contract. The lump sum price bid shall also include the cost of repairing or replacing reflectorized signs, when the Engineer determines that the reflective sheeting material no longer meets the specifications.

No payment will be made under Section 619 Basic Maintenance and Protection of Traffic for each calendar day during which there are substantial deficiencies in compliance with the requirements of this specification, as determined by the Engineer. The amount of each calendar day non-payment will be determined by dividing the lump sum bid by the number of calendar days between the date the Contractor commences work and the date of contract completion, as designated in the contract proposal, without regard to any extension of time.

In addition, liquidated damages will be assessed at the rate shown in Table 108-1 of §108-03, for each calendar day or part thereof that a cited deficiency, which results in non-payment, is not corrected, or is permitted to recur.

Partial payments will be made. Fifty (50) percent of the lump sum price will be paid when ten (10) percent of the contract work has been completed. The remaining fifty (50) percent will be paid proportionally in accordance with the total contract work completed, beginning with the estimate following the initial payment on this item.

619-5.03 Temporary Box Beam Barrier, and Temporary Concrete Barrier. The unit price bid per meter of temporary box beam barrier, and temporary concrete barrier shall include all material, equipment, and labor necessary to erect, maintain, and remove the required barrier, including any required connection devices, end treatments, delineation or guiding devices, repair of pavement after removal of box beam barriers, and devices for pinning and connecting temporary precast concrete barrier units. Any movement of temporary box beam barrier or temporary concrete barrier, except movements of the concrete barrier necessary to maintain, realign, or replace damaged units will be considered as a movement to a new location and the Contractor will be entitled to payment for the movement.

After placement, payment will be made for ninety (90) percent of the quantity of temporary box beam barrier, or temporary concrete barrier furnished and erected in accordance with the contract requirements. The remaining ten (10) percent will be paid upon removal. Temporary concrete barrier installed at the option of the Contractor, or required solely by a delay in the Contractor's operations, shall not be included in the measurement or payment for temporary concrete barrier.

619-5.04 Construction Barricades. The unit price bid per meter of barricade shall include all material, equipment and labor necessary to erect, maintain and remove required barricades. Whenever barricades are moved to a new location or the diagonal stripes are changed to allow traffic to pass on the other side of the barricade, payment will be made in the same manner as if it were a new barricade. Minor movements of the barricade from one side of the roadway to the other side, daily replacement to the same location or rearrangement within a work area, not requiring any change in the diagonal stripes, will not be considered as movement to a new location and will not be paid for as additional barricades.

After placement, payment will be made for ninety (90) percent of the quantity of barricade furnished and erected in accordance with the contract requirements. The remaining ten (10) percent will be paid upon removal. Type III Construction Barricades used at the option of the Contractor in lieu of drums or other channelizing devices shall not be included in the measurement or payment for Type III Construction Barricades

619-5.05 Lighting for Construction Barricades. The unit price bid shall include the cost of furnishing all labor, materials, equipment, and power necessary to provide, maintain, and remove Lighting for Construction Barricades. Should a barricade that is lighted be moved to a new location or the diagonal stripes be changed to allow traffic to pass on the other side of the barricade, payment shall be made in the same manner as if it were a new installation of lighting for barricades. Minor movements of barricades that are lighted, such as a movement from one side of the road to the other side or rearrangements within the same work area not requiring any change in the diagonal stripes, will not be considered as a movement to a new location. This will be true, regardless of the source of power.

After installation and demonstration of satisfactory operation, payment will be made for seventy-five (75) percent of the quantity of barricade lighting furnished and installed in accordance with the contract requirements. The remaining twenty-five (25) percent will be paid for upon removal. No separate payment will be made for the two flashing warning lights used at the beginning of each work zone drop-off, as required by this specification.

619-5.06 Temporary Structures and Approaches. The unit price bid shall include all labor, material and equipment necessary to build, move, remove, dismantle and/or store the structure specified together with all work related to construction, removing and restoring approaches.

Payment will be made at the unit price bid for each temporary structure and its approaches as follows:

Seventy-five (75) percent when the temporary structures and approaches are complete and operable.

Twenty-five (25) percent when the temporary structures and approaches or appurtenances are permanently removed.

619-5.07 Tubular Markers. The unit price bid for tubular markers shall include the cost of furnishing all labor, materials, equipment, and all incidentals necessary to complete the work in accordance with this specification and as directed by the Engineer. The unit price bid shall include the cost of replacing damaged reflective sheeting. The cost to remove and reset tubular markers due to contractor error shall be borne by the Contractor. Removal at the completion of the work or when no longer needed shall also be included in the unit bid price. Tubular markers that are in good condition may be relocated as directed by the Engineer. Whenever tubular markers are moved to a new location, payment will be made as if it were a new tubular marker.

619-5.08 Short-Term Pavement Markings. The unit price bid shall include the cost of furnishing all labor, material and equipment necessary to apply, maintain and remove short-term pavement markings in compliance with the requirements of §619-3.06. A separate payment will be made each time short-term pavement markings are first applied on a pavement course in accordance with the contract requirements. No payment will be made for the application, maintenance and removal of "temporary pavement markings" required after 14 days, or for short-term pavement marking necessitated by the Contractor's failure to place the final pavement marking paint before nightfall.

No payment will be made for the installation of Do Not Pass signs, delineators and plastic drums when necessitated by the Contractor's failure to place short-term pavement markings

619-5.09 Temporary Traffic Signal. The lump sum price bid for this item shall include the cost of all labor, materials, and equipment necessary to furnish, install, operate, maintain, move, and remove the signals for the required duration of the work. The bid price shall include the cost of electric power necessary to operate the signals until their removal is approved or ordered by the Engineer. Permanent signal control equipment will be paid for under separate contract items.

For the purposes of progress payment, the lump sum bid for the item shall be apportioned equally between the number of signals called for in the plans and proposal. If it becomes evident that a different number of temporary signals will be used, the lump sum bid should be apportioned equally between the revised number of signals and progress payments adjusted accordingly.

Payments will be made on each individual signal as follows:

Sixty (60) percent when the signal is installed and is in proper operation.

Forty (40) percent when all necessary work for this item is completed.

619-5.10 Mailboxes. The unit price for each mailbox shall include all equipment, material and labor necessary to move, maintain or replace rural route mailboxes in their final position or location. Only one payment for each mailbox will be made regardless of the number of times it is moved or replaced and shall be made when the mailbox has been placed in its final location.

619-5.11 Opening Highway to Traffic Prior to Contract Acceptance. Payment will be made for additional basic maintenance and protection of traffic as indicated in §619-1.09. The unit price bid shall include the cost of all materials, equipment and labor to provide the basic maintenance and protection of traffic.

In the event that additional signs, barricades, or other items are required to supplement the work under this item, payment shall be made upon erection as follows:

A. Where contract unit bid items, exclusive of lump sum items, cover the supplementary work ordered, payment will be made at the contract unit bid prices.

B. Where lump sum items, exclusive of the Basic Maintenance and Protection of Traffic item, or no contract unit bid items cover the supplementary work ordered, payment will be made at agreed prices or by force account.

No payment will be made under this item during any period for which the Contractor has been granted an extension of time with engineering charges and/or for which the Contractor has been assessed liquidated damages.

619-5.12 Other Work. The work required for Clearing and Grubbing, Furnishing and Applying Water, and Furnishing and Applying Calcium Chloride for dust control, and for placing bituminous plant mixed material for patching existing pavement, or where specifically ordered by the Engineer or as shown on the plans shall be paid for under their respective pay items. During the winter period when plant mixed bituminous material is unavailable the material used for patching shall be a suitable "winter mix" approved by the Materials Bureau. Payment for the bituminous patching material used, regardless of the type, will be made under the top course roadway paving item.

No payment will be made for any bituminous concrete determined by the Engineer to be necessary as a result of the Contractor's failure to complete paving operations prior to the weather and seasonal limitations, pursuant to §402-3.01. Also, no separate payment will be made for interim pavement markings, applied, maintained, or removed pursuant to §619-3.06 Short Term Pavement Markings.

Whenever any of the above items do not appear in the contract, payment for the work equivalent to such item will be included in the lump sum price bid for Basic Maintenance and Protection of Traffic.

619-5.13 Damage. Payment for damage to any phase of the work included in this section shall comply with the requirements of §107-09, Damage.

619-5.14 Maintain Traffic Signal Equipment. The unit bid price per signalized intersection per month shall include the cost of all labor, materials and equipment necessary to perform the work with the exception of inductance loop replacement which will be paid for separately. The cost of the electric power shall be the responsibility of the original maintaining agency. No payment will be made during any period for which the contractor has been granted an extension of time with engineering charges.

619-5.15 Flashing Arrow Board. The lump sum amount bid for this work shall include the cost of all material, equipment, labor, maintenance, and electrical power necessary to complete this work in a manner approved by the Engineer.

Progress payments will be made for this work in proportion to the total amount of contract work completed.

619-5.16 Construction Zone Pavement Markings. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to install, maintain, and remove pavement markings as required by §619-3.12. No payment shall be made under these items for short term pavement markings installed to meet the requirements of §619-3.06. When raised pavement markers are used to supplement a pavement marking stripe, payment shall be made for each item.

The non-payment and Liquidated Damage provisions of §619-5 Basis of Payment - General shall apply to these items of work.

Progress payments will be made. Quantities will be measured for payment when the pavement striping is satisfactorily installed and payment will be 75%. The remaining 25% will be measured for payment following satisfactory removal of the pavement striping.

Payment will be made under:

Item No.	Item	Pay Unit
619.01 M	Basic Maintenance and Protection of Traffic	Lump Sum
619.02 M	Construction Signs	Lump Sum
619.0303 M	Flashing Arrow Boards	Lump Sum
619.0413 M	Type III Construction Barricades	Meter
619.0502 M	Lighting for Construction Barricades	Meter
619.06 M*	Temporary Structures and Approaches	Each
619.10 M	Mailboxes	Each
619.1101 M	Opening Highway to Traffic Prior to Contract Acceptance	Lane Kilometer- Calendar Day
619.13 M	Temporary Traffic Signals	Lump Sum
619.1502 M	Short Term Pavement Markings	Meter
619.1611 M	Maintain Traffic Signal Equipment (Requirement A)	Intersection Month
619.1612 M	Maintain Traffic Signal Equipment (Requirement B)	Intersection Month
619.1613 M	Maintain Traffic Signal Equipment (Requirement C)	Intersection Month
619.17 M	Temporary Concrete Barrier	Meter
619.18 M	Temporary Box Beam Barrier	Meter
619.2001 M	Tubular Markers White Tape	Each
619.2101 M	Construction Zone Pavement Marking Stripes (Optional)	Meters
619.2102 M	Construction Zone Pavement Marking Letters (Optional)	Each
619.2103 M	Construction Zone Pavement Marking Symbols (Optional)	Each
619.2104 M	Construction Zone Pavement Marking Stripes - Removable Tape	Meters
619.2105 M	Construction Zone Pavement Marking Letters - Removable Tape	Each
619.2106 M	Construction Zone Pavement Marking Symbols - Removable Tape	Each
619.2107 M	Construction Zone Pavement Marking Stripes - Simulated by Raised Markers	Meters
619.2108 M	Construction Zone Pavement Marking Stripes - Supplemented by Raised Markers	Meters

* Refer to the *Standard* Contract Pay Item Catalog for full Item Number and full description.